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FOREWORD

*Parham Williams**

The Journal of Space Law is the publication of the Lamar Society of International Law of The University of Mississippi School of Law. Organized in 1965 to provide interested students a forum for discussion and debate of international law problems, the Society seeks to broaden its service to the profession by publishing this Journal devoted to contemporary problems of concern.

By limiting its scope to problems arising out of man's activities in outer space, the Journal fills a void in international law publications. Professor Stephen Gorove and the student members of the Society have worked diligently to produce the first issue of the Journal. The University of Mississippi School of Law is proud to sponsor this publication.

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*Dean, The University of Mississippi School of Law

INTRODUCTION

*Stephen Gorove**

In recent years many leading law schools in the United States have initiated the publication of a number of international law journals. Some of these journals are devoted to the broad field of public international law, others to international law and policy, maritime law and commerce, international and comparative law, and air law and commerce. None of them has, so far, been devoted to the legal problems arising out of man's activities in outer space. The L. Q. C. Lamar Society of International Law of the University of Mississippi School of Law takes pride in commencing the publication of what appears to be the first journal to deal exclusively with space law. This inaugural issue is devoted to the presentation of a "Symposium on Earth Resources Survey Satellites and International Law" which was sponsored by the American Society of International Law and held at the University of Mississippi School of Law on April 7 and 8, 1972 under the chairmanship of this writer and with the participation of such experts in the field as Dr. Franco Fiorio, Chairman of the U. N. Working Group on Remote Sensing of the Earth by Satellite, Eilene Galloway, Senior Specialist in International Relations in the Congressional Research Service of the Library of Congress, Professor George A. Codding, Jr. of the University of Colorado, Eugene Brooks, President of Peace Studies Inc., and John R. Tamm, Attorney at Law of Daytona Beach, Florida.

In an attempt to provide a scholarly publication of continuing interest and general appeal, the Journal is greatly honored to be able to draw upon the advice of leading authorities knowledgeable in the field of space law. The eminent authorities who have so far agreed to serve on the Editorial Advisory Board of the Journal of Space Law include Judge Harold Berger, Chairman of the Federal and Inter-American Bar Associations' Committees on Space Law, Professor Aldo Armando Cocca of Argentina, Ernst Fasan. Secretary of the International Institute of Space Law of the International Astronautical Federation, Eilene Galloway, Senior Specialist in International Relations in the Library of Congress, Professor D. Goedhuis of the Netherlands, Wilfred Jenks, Director-General of the International Labour Office, Myres S. McDougal, Sterling Professor of Law at Yale.

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*Chairman of the Editorial Advisory Board and Faculty Advisor.

Eugène Pépin, President of the International Institute of Space Law of the International Astronautical Federation, Michael S. Smirnoff, member of the Board of Directors of the International Institute of Space Law, and Isodoro Zanotti, Chief of Division of Codification and Legal Integration of the Organization of American States. It is hoped that the knowledge and experience of these authorities will help the Journal on the long road toward achieving both national and international recognition and excellence.

As the first issue of the Journal of Space Law is going to press, it is appropriate to record the Journal's indebtedness to the American Society of International Law for the latter's sponsorship of the "Ole Miss" regional meeting which served as a forum for the presentation of the papers published in this Symposium. Last, but not least, it is a pleasure to take note of the special gratitude that the Journal owes for its coming into existence to Dean Parham Williams. Without his encouragement and support, the painstaking work of the editorial staff could not have come to fruition.

INTERNATIONAL IMPLICATIONS OF EARTH RESOURCES SURVEYS BY SATELLITES

*Dr. Franco Fiorio**

The purpose of this paper is only to present some of the problems in the area of remote sensing of the earth by satellites. My remarks will suggest no legal solutions, propose no legal studies, indicate no possible legal endeavors in this field, but simply submit a general review of the situation in this subject and point out the areas that, to my pragmatic engineering mind, seem to be a likely food for thought for sophisticated legal minds.

The first thing that I would consider, would be to check how the "Treaty on Principles Governing the Activities of States in the Exploration and Uses of Outer Space, Including the Moon and Other Celestial Bodies", commonly known as the "Space Treaty", fits in with the activity of remote sensing of the Earth by satellites.

I had the privilege and the honor to participate in the formulation of that treaty and to cooperate in the writing of the nine principles which formed the original core of it and I can assure you that, at that time, nobody in the U. N. thought about anything even remotely resembling an Earth Resources Survey Satellite activity as we are beginning to know it today. Remember it was 1966, and six years of space development are a long, long time.

Which parts, then, of the Space Treaty might be related and applied to the remote sensing of the Earth by satellites?

I suggest that, setting aside the generalities such as the prohibition of carrying nuclear weapons, the non-discrimination clauses, that is the right of access to space by everybody, contained in the first three Articles of the Treaty, and the equally generic recommendation to inform everybody on one's activities in space, the really pertinent articles are Articles VIII and IX.

The first states "A State Party, on whose registry an object launched into outer space is carried, shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched in outer space, including objects landed or constructed on a celestial body, and of their component parts is not affected by their presence in outer space or on a celestial body or by their return to Earth."

Now, to my simple thinking, ownership of a satellite for earth resources surveys, means that its owner can do what he wants while on board, provided he respects the proviso contained in Article IX, namely that "States shall conduct all their activities in outer space, including the Moon and other celestial bodies with due regard to the corresponding interests of all other States party to the Treaty".

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*Chairman of the United Nations Working Group on Remote Sensing of the Earth by Satellite.

This means that the taking of pictures or the use of other remote sensing equipment, such as multi-spectral sensors, from space, which could hardly in itself hurt the interests of other States party to the Treaty or, in line with the second proviso of Article IX, could hardly cause potentially harmful interference with the space activities of such other States, should not be considered an infringement of the Treaty and thus should not be opposed by the States party to the Treaty themselves.

You will notice that I used the words "in itself" and I did it on purpose because we find ourselves in the same position of the fellow who from the window of his apartment snaps a picture of a pretty girl walking on the street below him; while he simply takes the picture and keeps it for himself, he is within his rights to do what he pleases at his home. The problem arises if he tries to show or sell that picture to other persons without the authorization of the girl involved. In other words, the picture taking in itself is harmless, but the use of the resulting picture might be controversial.

The first question presented is therefore: am I right that remote sensing of the earth by satellites is, in itself, consented to by the Space Treaty, specifically by Articles VIII and IX of it?

Before turning to the statement of my next problems and my next question, I deem proper to offer some condensed information on how remote sensing is performed and of the capabilities of this new technique in rather broad terms.

First of all, remote sensing by satellites can be performed in three modes: passive sensing—namely by picking up the natural radiation which both animate and inanimate objects emit continuously in one or several frequencies; active 'cooperative' sensing by which you receive specific signals sent by a ground instrument operated or approved by the local authorities, and 'non-cooperative' active sensing, by which an active signal is sent by the satellite to detect ground features without the cooperation of local entities.

Radar and laser surveys could be placed in the category of 'uncooperative active sensing' and this raises the interesting speculation whether or not uncooperative active sensing intrudes on the privacy of the surveyed entity.

Let me give an example: suppose that a country does not want a survey taken of certain crops it grows on its territory and covers them with some canvas or other means to prevent remote sensing by satellite through passive sensing, that is photo and multi-scanning. A radar beam would penetrate the cover and survey the crop against that country's will. Would this be considered an action against the "corresponding interest of another party" or "potentially harmful interference with the space activities of another party" in the framework of the Space Treaty, or simply infringement of the sovereign rights of another state?

There are, however, two mitigating circumstances to be considered. First—if the surveyed country really wants to hide its crop it could use protective material which is

radar and laser proof; secondly, if the radar or laser survey is made without harmful or disturbing effects for the surveyed country while it is performed, in itself it could be considered in the same class of picture taking, and thus be acceptable under the Treaty.

But, again, this is something that will have to be studied and assessed. Keeping also in mind that any legal limitation which might result from your thinking should have also a certain pragmatic connotation, that is, produce rules which chould be respected, if not enforceable, in a practical way.

Having mentioned the modes of remote sensing by satellites, I wish to touch upon one of the parameters of remote sensing, which might enter into your consideration, namely what we call "resolution". This, as it is well known even to amateur photographers, is related to the amount of information which can be detected in a picture or image of a certain area. The sensitivity and/or the legal rights of a surveyed party might well depend on the degree of resolution obtainable by satellite surveying.

To clarify this with an example; suppose that somebody takes a picture of the roof of a building on which there are some girls sunbathing. If the resolution is such (say 1000 feet) that only the roof is visible and the girls on it are only shapeless blurs, it would probably be alright, but if the resolution is such (say 1 foot or less) as to allow those shapeless blurs to take their proper shape, then the matter is completely different.

To further complicate the problem, I venture to say that, although we know rather well what the resolution of Earth satellite surveys will be in the first experiments scheduled for the next few years, nobody knows what the resolution of future operational systems might be in the near and much less in the far future.

The possibilities offered by remote sensing of the Earth by satellites are numerous. Regarding only a few of these possibilities, it is noted that this technique can be used to monitor the conditions of the atmosphere and to measure the amount and type of pollutant contained in it. It can also be used to trace the sources of pollutions and, in this respect, it might reveal that a certain country is polluting the air in a neighboring one, so that the surveying country might find itself in the position of witness of one against the other, unless it chooses not to reveal the information to anybody.

The same applies for water pollution and to hydrological management of regions including more than one country; in any case remote sensing by satellites can be of great benefit to assess water resources on land, oceanic currents and state of the sea, location of oceanic plankton and associated fisheries informations which might be very valuable.

In the agricultural domain, in addition to hydrological informations, remote sensing satellites can provide information about the conditions of the crops, the composition of the soil, the need of fertilizers or insect killers and so forth.

Remote sensing satellite can provide accurate mapping and border definitions, geological surveys and discovery of rock formations associated with possible mineral deposits; monitor vulcanic activities and assess earthquake movements and damages.

Finally, satellites can be used for urban planning and development, for land use surveys, for coastal erosion monitoring and the like. There will probably be many more uses of such satellites in the future, which we are not in the position to forecast today, especially in the biological and animal monitoring area. Hence, this listing is by no means complete.

As noted previously, so long as the satellite takes pictures, multispectral images and performs other sensing activities, it does not, in itself, present particular problems. But any sensing in any mode produces data, in the form of signals, images or tape, which will have to be transmitted to the Earth, received and processed by ground stations and eventually stored, retrieved and disseminated.

While the scientists and engineers have their hands full in devising practical and economical ways to do the transmission, reception, elaboration, processing and storing of the data collected by Earth resources satellites, the main problem, from a legal standpoint, is that of dissemination.

Here is where the sovereign and associated legal rights of each country whose territory has been surveyed by satellite might come into play, and here is the area which is not covered by the Space Treaty nor by any other existing agreement.

Some of the interrogatives which arise in this respect are: will the country which performs the satellite's survey have the right to pass the information obtained on the territory of another country to international, private or governmental entities other than the Government of the surveyed country? If this is not the case, would the surveying country be entitled to compensation for the expenses made in collecting the data, and transmitting it to the surveyed one, and, if so, according to which criteria?

Those questions acquire a major significance in view of the fact that much of the data which can be obtained by satellite surveys might be extremely valuable and/or sensitive.

Take for example the assessment of the status of certain crops: wouldn't Wall Street love to know in advance what the future yield of some crops will be? Or in the case of water pollution from a country to another country: would the information have to be given to both countries since the territories of both countries are involved? And in such a case what would be the position of the surveying country? It might well be that the simplest solution could be to simply disseminate all the data to everybody. However, some countries have already expressed the firm position that they do not want the information about their territory to be disclosed to certain other countries. Therefore, a wholesale distribution does not seem to be the answer.

It has also been suggested that the dissemination of data should be put under the wing of an unbiased international organization such as the United Nations; but upon further analyzation you will see that some of the objections and legal difficulties would persist even under United Nations data management, let alone the fact that, as it is, the U. N. has not the capability of handling such a gigantic endeavor as would be the mountain of data, pictures and tapes produced by operational Earth surveying satellites on an operational basis for the service of all member States.

However, I will not conclude my remarks without giving you a word of practical advice. First of all, you have to be careful, whatever rules and regulations you might conceive, not to formulate them in such a way as to restrain unduly this new space technique, which might become one of the most powerful tools for the welfare of mankind.

Secondly, I should recommend you to use the same wisdom which was used in the preparation of the Space Treaty, namely to proceed first to the formulation of a number of acceptable principles, and then to prepare rules which would be broad enough to encompass foreseeable and perhaps unforeseeable developments in the future. As is the case of the Space Treaty detailed rules and regulations could be drawn later stemming from the same broad rules, but taking into account the experience made in the future operation of remote sensing satellites and the exciting developments that, I am sure, will be brought to us in this field in the years to come.

TECHNOLOGICAL AND LEGAL ASPECTS of ENVIRONMENTAL MONITORING

*Eugene Brooks**

The best testimony to human intelligence is the growing attention man is giving to his own survival. With population and pollution growing and resources dwindling, the issue has already been joined between advocates of global equilibrium and advocates of unlimited growth.

Even if man wisely chooses to moderate his increase, new people will come and economic expansion will still continue for at least several generations.

In this light, the environment is also a resource. A useful distinction can and should be made between tangible resources and the environment. By earth resources is generally meant animal, plant and mineral assets and artifacts that can be put to human *use.* These include air, soil, water, crops, metallic deposits, petroleum products, fish and animals. By environment is generally meant the conditions of the physical world, its atmosphere, bodies of water, land, and other organisms that have a substantial *effect* on man. At some points, particular resources and the environmental settings in which they are placed, intersect and merge. To speak of pollution of lakes and oceans is to speak of both resources and environment at once; so with the intrusion of weeds, pest and disease into cultivated areas.

Since the relation between resouces and environment is so close, this discussion of technical and legal aspects of monitoring will be necessity include both resource and ecological aspects, with emphasis on the latter.

Fundamental Physical Background

The universe, whatever its original form, now consists of matter and energy. Energy, the ability to do work, exists in various forms: gravitation, heat, chemical energy, nuclear energy and radiation.[1]

Electromagnetic energy, or radiation, is an extremely attenuated form of matter, as shown in the equation, $E=MC^2$.[2] When electromagnetic energy is radiated, it takes a wave form, a disturbance, which is propagated through space. All radiant energy exists in the form of these electromagnetic waves which can be arranged in a table of decreasing wave

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[1]Dyson, Energy in the Universe, *Scientific American,* September, 1971, at 51-52.

[2]*Gamow, Matter, Earth and Sky* 117 (1963 ed.). It would perhaps be more correct to say that matter is an extremely compact form of electromagnetic energy.

lengths.[3]

The number of waves emitted by the source per unit of time is its frequency and the distance from crest to crest or hollow to hollow of the wave, is its wave length. For remote sensing purposes this wave length (u) is most usefully measured in microns (u m), a micron being a millionth part of a matter.[4] Electromagnetic energy may also be described as travelling in discreet packets, "quanta" or "photons". The amount of energy in a particular quanta of radiation is inversely proportional to the wave-length of the radiation; that is, the longer the wave length, the less energy is contained in the packet; the shorter the wave length the more energy (and higher frequency) concentrates there. This is why gamma rays and x-rays harm human tissue.

Electromagnetic waves vary in length from long electric waves, miles long, through infra-red (heat), visible light, ultra-violet light, x-rays, and cosmic rays, the latter one-one hundred millionth of a micron (.000000001 u m).

Most substances—vegetation and natural or man-made surface features—selectively absorb, transmit, reflect, emit or can be made to emit, electromagnetic radiation at characteristic wavelengths peculiar to the composition of the object under observation. These are their spectral "signatures", which may be compared to fingerprints.[5] Sensing systems register the radiation that impinges on them. Passive sensing systems, like cameras, receive or calibrate these signals, whose source is sun radiation or thermal emissions from earth. Active sensing systems, like radar, send out electromagnetic impulses to trigger, from their targets, reflected impulses which are in turn registered by the devices employed.[6]

Remote sensing, then, is the technique that registers, from a distance, one or more bands of the electromagnetic spectrum. It can and has been done for millions of years by man, from earth's surface, using the human eye as a sensing system. More recently it has

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[3]12 The World Book Encyclopedia 252 (1964 ed.). Radiation is generated from every object in the universe by virtue of oscillations of the atoms and molecules of matter. Weaver, Remote Sensing, New Eyes to See the World, *National Geographic*, January, 1969, at 48-73.

[4]A meter is 39.37 US inches. A micron is 1/25,000 of an inch. The useful measurement for longer wave lengths is the centimeter, 1/100 of a meter; while for extremely short wave lengths, an angstrom, one ten-thousand millionth of a meter or one hundred millionth of a centimeter, is the customary standard.

[5]*National Aeronautics and Space Administration, Remote Measurement of Pollution* 39-40, NASA Pub. SP285 (1971). When radiation strikes an object, it absorbs more of the light and re-emits the energy in the infra-red. A different sort of electrical reading, depending on chemistry, particle sizes, etc. comes from each object. These readings can be plotted on a graph, or placed on magnetic tape and entered in digital bits in a computer.

[6]*Committee on Peaceful Uses of Outer Space: The Use of Earth Survey Satellites in Monitoring the Changes in the Global Environment*, Un Doc. A/AC.105/C.1 VIII, CRP. 1, March 8, 1971, pp. 10-11.

been done effectively from the platform of aircraft, and most recently from spacecraft using various sensing devices.

For most purposes, remote sensing devices use the middle portion of the electromagnetic spectrum, from about 20 microns to about .2 microns. This spans the infra-red portion of the spectrum (0.7 u m), the visible portion (light 0.4 u m to 0.7 u m), and ultra-violet (0.25 u m to 0.40 u m). Except where a static picture of a resource or condition at one point of time is desired, the mere reception of data is not enough. For practical use, remote sensing requires signature studies for comparisons, sensor development, data processing, and information dissemination.[7]

Previous Experience With Environmental Monitoring

Remote sensing by satellite of the environment is as old as space flight itself. No exhaustive review will be attempted here but it is necessary to put past efforts in perspective. Worthy of note are the experimental weather satellites, TIROS (Television Infra-Red Observation) first sent aloft in 1960. Improved versions launched in 1965 acquired data from the entire earth's surface, except under polar night, every 24 hours. Many were outfitted with Automatic Picture Transmission (APT) Cameras, vertically pointed toward earth, which took pictures 2,000 statute miles on each side or 4 million square miles. The pictures are broadcast to all ground stations equipped with suitable telemetry, within a range of 2,100 miles from the aircraft. Other sensors measured atmospheric heat. Experimental NIMBUS satellites launched between 1966 and 1970 tested sensors to measure the vertical profile of temperatures, water vapor and other atmospheric constituents. Still in operation are Applications Technology Satellites (ATS 1 and 3) launched in 1966 and 1967 which, from orbits of 22,300 miles above the equator, take pictures of cloud systems, storms and hurricanes. These pictures are hooked into the National Weather Service by the Automatic Picture Transmission System already mentioned.

On an international plane, the World Weather Watch, coordinated by the World Meteorological Organization (WMO) transmits the results of cloud system and surveillance to 554 APT receivers in 94 foreign countries and territories. Information in the form of television pictures in the visible and infra-red spectrum, is provided by improved US TIROS Satellites and the USSR Meteor System.

In addition to these weather pictures, images of cloud free areas indicate the limits of ice cover of seas and lakes and snow cover in mountain areas. The US produces operational snow and ice boundary charts for the Northern Hemisphere.[8]

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[7] Id.

[8] *Senate Committee on Aeronautical and Space Sciences, International Cooperation in Outer Space, a Symposium,* S. Doc. No. 92-57, 92nd Cong., 1st session 75-83, 339-340 (1971), at also supra note 6, see 17.

Meteorology

– Observations of current state of weather permit interpreters to locate fronts, cyclonic storms, high and low pressure areas, the jet stream, severe weather platforms, tropical storms, atmosphere stability, high and low level wind fields, sea ice conditions and snow cover. This information supplements ground based observation and fills in gaps for data-sparse areas. The information has been used extensively for weather forecasting.[9]

Climatology

– Cloud pictures and infra-red measurements permit analysis of climate over a time basis.

Hydrology

– The advance or retreat of the edge of snowfields are detected.[10]

– Surface snow temperatures are measured.

– Atmospheric temperature and moisture content profiles obtained.

– Flood forecasting has been successful in the Midwest and California, and the relay of information from remote ground based guages is possible.

Oceanography and Hydrography

– The activity in these areas has been limited to mapping sea surface temperature and outlining such ocean currents as the Gulf Stream.

– The mapping of coastal waters in inaccessable areas may be possible, since shallow water appears lighter in photos than does deep water.

Solar Terrestrial Research

– Monitoring the earth envelope for electromagnetic radiation during sun disturbances has been undertaken.[11]

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[9]Id. 84-98. The Department of Commerce credits satellites advisories with reducing the death toll in India in October 1967, from a severe tropical storm, and similar feats in Burma, Fiji, Mexico and Mozambique, with saving ships, with preparation of sea-ice bulletins and charts necessary to fishing and shipping interests in Canada, Iceland, Sweden and Argentina; with locust breeding predictions based on wind patterns in Ethiopia; with predicting heavy rains in Franch Guiana and Martinique, and so forth. Satellite cloud pictures correctly indicating rain were credited with spoiling a perfectly good Labor Day weekend in the state of Washington in 1970.

[10]Baker, Remote Sensing of Snow Fields from Earth Satellites: 2 *Proceedings of the International Workshop on Earth Resources Survey Systems* 431-440 (1971).

[11]Supra note 8, at 83-105.

Previous Experience with Resource Surveys

The Geologic Survey of the Interior Department in cooperation with NASA has engaged in a number of test programs for resources in the EROS (Earth Resources Observations Systems) Program. The US Department of Agriculture and NASA are also collaborators on test programs.

Among typical surveys recently reported are:

1. Feasibility studies were made in Arizona for taking inventories of agricultural crops with present technology, using small scale aerial and space photography.

2. Crop identification studies were made in Arizona and California with multiband photography at different times (multidate), with the use of human interpreters. It was found that multi-band photos were superior for this purpose to single band, and multidated studies even better.

3. Forest inventories were taken in Mississippi by satellite and compared with ground inventories with good to indifferent results.

4. Different types of terrain (bedrock, vegetated rock, rubble, forest, bog, etc.) were mapped automatically with some success in Yellowstone National Park. The significant problem for automatic mapping was that spectral signatures of a given class vary widely with time of day, season of year, latitude and flight direction. The spectra alone cannot adequately identify materials, and extensive preprocessing is required.[12]

On a bilateral or cooperative basis, using aircraft or spacecraft, the US and Canada are studying Lake Ontario as a source of non-polluted water; the US and Mexico are studying geo-thermal conditions near Lake Chapala, Mexico and assisting the training of Mexican scientists in the general range of agriculture, forestry and oceanographic applications. With proton magnetometer measurements from Cosmos 49, the US and Russia are studying the magnetic effects in the atmosphere to get a better understanding of the earth's crust, fault, fracture systems and heat flow. Geo-thermal studies leading to new power sources are being undertaken with Iceland. An Australian-American effort features crater studies. Another Mexican-US effort through the Eros program with NASA funding and University of Michigan aircraft inquires into water-fowl habitat and census.[13]

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[12]References for the enumerated experiences appear in the Proceedings of 2 International Workshop on Earth Resources Survey Systems 3, 39, 83, 303 (1971).

[13]Supra note 8, at 117-138. See also Logsdon and Hannessian, Earth Resources Surveys—An International Framework Begins to Develop, *Astronautics and Aeronautics,* September, 1971, at 30-35.

Remote Sensing Systems

In order to fully appreciate the advantages and limitations of remote sensing systems, it is helpful to know what they are and how they work.

Cameras

The camera is the oldest and most widely used sensor, as versatile on satellites as in aircraft and usable in both manned and unmanned systems. The conventional metric camera, operating in the visible spectrum with different lens options and panchromatic film, sensitive to light of all colors, is versatile and provides sharp images.[14] A multiband camera, with a focal length of 24 inches, orbiting at 500 nautical miles, can cut a swath 200 miles wide and resolve features as small as 50 feet.[15]

A multiband camera makes simultaneous photographs in several bands in the spectrum. It uses a variety of lens, filter and film types in combination to elicit the most information from each band, and can cover wave lengths from 0.4 to 0.9 microns, which spans the visible spectrum and goes into the very near infra-red. From photographs taken in these different parts of the spectrum, one can derive the necessary spectral "signature" for each terrain and water feature.[16]

Optical cameras are useful for almost all earth resource sifting, except during darkness, as the NASA chart Fig. 1, attached hereto, indicates.

Another type of camera is the panoramic camera which photographs a large area in one exposure yielding high resolution. At 500 nautical miles it cuts a swatch 820 miles wide.[17] To do this, it needs a narrow, angular field provided by a narrow slit in the viewing portion of the camera. To obtain the large swath, it pans, or moves from side to side, while the frame of the film is held in the form of an arc.[18]

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[14]North, Remote Sensing of Environmental Pollution, 2 *International Workshop on Earth Resources Survey Systems* 292, (1971). Colwell, Remote Sensing of Natural Resources, *Scientific American*, January, 1968; *Space Applications in Water Resource Development*, I *Space Exploration and Applications*, UN Doc. A/Conf. 34/2 at 622,625 (1968).

[15]Supra, note 6, at 68.

[16]Every agricultural crop, for example, has its own distinct life cycle which is documented in a crop calendar. Since one can preduct when a crop might possess a unique signature, multiband photography increases the reliability of crop surveys, supra note 12, at 33.

[17]UN Doc. A/AC.105/C.1/VIII/CRP.2, March 9, 1971, at 63.

[18]Colwell, supra note 14, at 57.

Infrared and Multispectral Line Scanners

Infrared scanners, also known as optical mechanical scanners, detect thermal or heat energy emitted by objects. They "photograph" this heat indirectly. The end of an electrical conductor, or detector, is coated with heat sensitive copper or gold dipped germanium no longer than a pinhead. The detector requires cooling with liquid nitrogen or helium. When the target terrain sends up infrared photons, this energy is directed to the detector by a rotating mirror. "Infrared photons striking the detector generate an electrical signal that varies in intensity according to the amount of thermal energy coming from the part of the terrain then being viewed by the mirror."[19] The signal, converted to a beam of electrons, generates visible light, as on a cathode-ray tube. This image, varying in brightness with the strength of the electric beam (and heat of the terrain scanned) is caught on photographic film, and provides in effect a "thermal map of the ground".[20]

Infrared scanners can monitor the surface temperature of water bodies and the heated discharge from factories and power plants. They can be used day or night, since they record heat energy, not the sun's reflected energy.

Multispectral scanners operate like infrared scanners, but can record data in other portions of the spectrum, providing multiband imagery, from ultraviolet through infrared.[21]

Radiometers

Radiometers, like infrared sensors and multispectral scanners, receive and record reflected electromagnetic energy, but unlike the latter do not provide a visual image of this energy. Instead, they *measure* this energy by displaying the data graphically on a strip chart recorder. Any sensor that provides a measurement of total incident radiant energy may be classed as a radiometer. The term is applied most often to instruments that measure radiation from infrared through microwave, but they can be built to record ultraviolet as well. By correlating the gray tone imagery of scanners with radiometer measurements, accurate temperature readings may be taken, dispensing with the need for taking ground temperature samples. Radiometers are most useful in deducing the surface properties of large, homogenous areas. In the field of pollution, they could determine the thickness of crude oil slicks on water. Used as a measurement of atomic absorption, they can determine, spectrally, the distribution of a particular constituent in the atmosphere.[22]

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[19] Id. at 58-59.

[20] Id. at 60.

[21] North, supra note 14, at 292-293; Colwell, id. at 60.

[22] Supra note 5, at 49. Each element responds to radiation in a characteristic frequency and wave length. The radiation of that constituent, say nitrogen, indicates its presence in the atmosphere by emitting radiation, and also by absorbing the radiation of the same constituent of descending sunlight, removing the signature of that constituent in the microwave spectrum.

Radar

Radar is a scanning technique that provides an image output on a cathode-ray tube, like television. It is more useful for resource surveys than for pollution, although it is good for oil detection, monitoring strip mining operations and changes in the landscape. Side looking radar (SKLAR) is an all weather, round the clock sensor effective in imaging large areas of terrain. It can penetrate cloud cover and vegetation cover. Operating in the microwave portion of the spectrum (between infrared and larger radio waves), a radar antenna sends pulses from the spacecraft's side to earth, which rebound, are received, translated into an electrical stream, made visible by an impact on a cathode-ray tube. The patterns of light and darkness produce an image which is recorded on film.[23]

Spectrometer

A spectrometer detects elements by dispersing a spectrum with grating or prisms and scanning the frequencies that are either emitted or absorbed. A related instrument, a spectrograph presents all frequencies on a recording medium, such as film or tape.[24]

A correlation spectrometer is non-imaging. It detects quantities of gases, measuring concentrations of a single air pollutant in the column of air being examined, and printing the results on a strip chart recorder.

Spectrometers are useful in a wide spectral range, particularly the infrared. In tests, they have detected sulfur dioxide and nitrogen dioxide from aircraft, and are, of course, as useful on ground to check various smokestack emissions.[25]

Gamma ray spectrometers, functioning at very short wave lengths, can locate radioactive substances at great distances. They can operate in as many as 400 different wavelength bands, distinguishing several radioactive minerals.[26]

Interferometers

An interferometer is a device that divides a beam of light or infrared radiation into two or more beams and then brings them together, by reflection, to measure wavelength. Interferometers are "multiplex" in character; they accept the energy of the entire spectrum within a signal, as opposed to scanners, which are limited to the wave lengths to

[23]Colwell, supra note 14, at 60-61.

[24]Id. at 49-50.

[25]North, supra note 14, at 293-294.

[26]Colwell, supra note 14, at 61.

which they are tuned. However, interferometers require considerable data processing and are susceptible to vibration distortions. Interferometers have produced vertical temperature and water vapor profiles on a global scale and may be used for identification and measuring, rather than mapping.[27]

Optical Correlation Instruments

These instruments match, or correlate, the spectrum of a known gas to that of an unknown sample in the same spectral regions. They identify, rather than survey. A correlation instrument passes light through a filter and matches its characteristics with the spectrum of the compound whose identity is sought. Plates with slits may be used to match the known and unknown samples, or reproductions on transparencies may be employed. Signal intensities can also be matched to gauge the concentration of the compound in question. Since the instrument can measure only spectra of specific compounds, it is most useful in measurements of gaseous pollutants of the atmosphere, whose number is not large, rather than for surveys.[28]

Laser Systems

Laser is an instrument that produces a short, high power pulse of coherent light. Laser radar sends this pulse through the atmosphere, colliding with molecules and scattering back light to a receiving telescope. This back-scattered light is filtered and measured by a photomultiplier. The signal is analyzed for deviations indicating dust particles. The spectral characteristic can be analyzed to determine contaminants and their profiles. Laser radar is therefore useful for detecting, identification and measurement of particulate pollution and insecticides.[29] Lasers must be specially tuned to the wave lengths of particular pollutants.

Fraunhofer Line Discriminator

A Fraunhofer Line Discriminator compares the atmospheric absorption of a selected line in the solar spectrum with the reflection spectrum of a surface that is suspected of luminescence. The ratio of the intensity from one point of a spectral line to another is greater where luminescence is present than when it is not. The spectral range of this instrument is ultraviolet to near infrared. The use of the device is to measure fluorescence, particularly that caused by oil. It has detected five parts of Rhodamine WT

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[27]Supra note 5, at 50, 100.

[28]Id. at 50-51.

[29]Id. at 51-52.

dye per billion; by mixing pollutants with this dye, the dispersal of the pollutants may be traced.[30]

The choice of sensors and their auxiliary and supplementary devices, and the combination of sensors in task-solving are technical matters not here appropriate to non-technical exposition. Several tables are attached which indicate the complexities involved. Gary W. North of the US Geological Survey has developed a "matrix" which attempts to connect the particular sensor to the environmental problem. NASA has developed a Sensor, application correspondence for Remote Sensing of Water Pollution and for atmospheric gases. With respect to resources, Fig. 1, referred to earlier, indicates practical applications of resource sensors in four main useful categories of wave lengths. It would be appropriate, however, to summarize the usefulness of remote sensing by satellite, after brief mention of an imminent US satellite venture.

The US Earth Resources Technology Satellite

The Earth Resources Technology Satellite (ERTS), launched on July 23, 1972, is one of two satellites, the second to be launched in 1973. The monitoring payload consists of a television scanning system (Return Beam Vidicon-RBV subsystem) and a Multispectral scanning system (Multispectral Scanner subsystem MSS) which will furnish independent ground views. The observatory makes 14 revolutions a day and proceeds westward, retracing its steps every 18 days to scan every part of the planet except small polar regions, once every 18 days.

Three vidicon cameras are sensitive to three different spectral bands within 0.48 to 0.83 microns, and two video tape recorders store up 30 minutes of picture information for delayed readout. The multispectral scanner operates continuously, with an array of detectors simultaneously in four spectral bands from 0.5 to 1.1 microns. Both subsystems scan a 115 mile by 115 mile square of the earth's surface.

ERTS-1 also relays signals picked up from about 150 automatic, ground-based scientific stations scattered around remote areas of North America.

Unlike previous space programs, pictures and data are available to members of the general public at nominal cost and are not restricted to select research groups.[31]

Remote Sensing by Satellite in Perspective—An Overview

It is essential to point out that the technology for remote sensing by satellite is in being only in part, and some of the technology has not been tested extensively, or tested

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[30]Id. at 167; North, supra note 14, at 294.

[31]General Electric Pamphlet, ERTS, undated.

only in aircraft.

With respect to the environment, remote sensing by satellite is only one platform, or method, of monitoring. Its exact utility cannot be precisely placed until it is fully tested, and there is some difference of opinion as to its full utility.

One recent report by the Commission on Monitoring of the Scientific Committee on Problems of the Environment (SCOPE) to the United Nations Conference on the Human Environment[32] in among nineteen recommendations suggested a network of at least ten *terrestrial* (including freshwater) baseline stations to be established immediately in a variety of different geophysical regions of the world (northern tundra, high mountain, etc.), and that baseline stations in the marine environment be established after pilot studies.[33] SCOPE also recommended, in addition, the establishment of regional stations which would be correlated with the baseline stations. A baseline station is one that tells the present state of the system. It enables scientists to detect changes of major significance by comparing data taken at a later time with data taken at an earlier time. Baseline stations are anticipated to be established in areas about 4 kilometers square, in areas free from human intervention and direct contamination.[34]

SCOPE outlined three major problem areas considered to be most relevant for early implementation in a global monitoring program:

1. Potential adverse climate change resulting from human activities;

2. Potentially adverse changes in biota and man from contamination by toxic substances, including radionuclides;

3. Potentially adverse changes in biological productivity caused by improper land use (reduced soil fertility, soil erosion, extension of arid zones, etc.).[35]

The following phenomena bearing on these problem areas were recommended for priority treatment:

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[32]*International Council of Scientific Unions, Scientific Committee on Problems of the Environment: Global Environmental Monitoring* (1971), Stockholm, 1971 [hereinafter referred to as *SCOPE*]. The U.N. Conference on the Human Environment has taken place since this article was written. In addition to a statement of General Principles, an "Action Plan" for international monitoring of the environment was adopted. The Conference also agreed on a new coordinating unit within the U.N. The documents were not available to the writer at the time of publication, but representatives of the Secretariat informed him that the "Action Plan" closely follows SCOPE's recommendations.

[33]Id. at 6, 8, 15, 48-52.

[34]MIT Sponsored Report of Study of Critical Environment Problems (SCEP): *Man's Impact on the Global Environment* 173 (1970).

[35]SCOPE, supra note 32, at 27.

a) For assessing secular changes of the global climate:

1. Atmospheric turbidity (aerosol content),

2. Atmospheric carbon dioxide,

3. Solar radiation,

a) broad-band direct, and diffuse radiation,

b) narrow-band direct radiation,

c) net (incident minus reflected) all-wave radiation,

4. Standard meteorological data;

b) For assessing the degree of pollution in all media:

5. Mercury,

6. Lead,

7. Cadmium,

8. DDT, its metabolites and degration products,

9. Polychlorinated biphenyls.

Fourteen additional variables were listed as added starters to the baseline station program on a non-priority basis.[36]

Some monitoring can be performed best by methods other than satellite. The location of some subjects, such as ocean bottom soil or deep water temperature readings, requires physical capture or direct contact. The taking of samples is a time honored practice. Ground measurements of various phenomena take place regularly: the measurements of solar radiation and CO^2 content are made in numerous countries by

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[36]Id. They are (a) For assessing secular changes of the global climate: (1) Vertical distribution of Aerosols, (2) Size distribution of aerosols, (3) Rawindsonde data, (4) Surface Vertical fluxes of carbon dioxide, (5) Ozone, water vapour and trace gases in the stratosphere (in association with the reference station programme), (6) Global albedo by satellites (in association with the reference station programme); (b) For assessing the degree of pollution of the biosphere: (7) Petroleum products, (8) Persistent organochlorine compounds other than DDT, (9) Chlorinated aliphatic hydrocarbons, (10) Chlorinated phenoxy acetic acid derivatives, (11) Relevant compounds in the cycles of S, N, P and C, (12) Certain metals (As, V, Zn, Se, Cr, Cu, Be, Ni, Mn), (13) Organophosphorus compounds, (14) Oxygen in water.

numerous services, under arrangements with WMO.[37] Or, satellite sensors may be the supplementary, rather than the primary monitoring method of other phonemena.

At present, on site techniques are generally more accurate than remote techniques; satellite techniques must be improved if they are to furnish the required high precision data. The trend may, however, veer toward remote sensing. Where meticulous attention to difficult detail is required, a human work difficulty arises, particularly in isolated regions under institutional control. Then there is a problem of standardization and interpretation by many stations.[38]

The virtues of remote sensing for both environmental and resource surveys may be listed as follows:

1. Global coverage in short periods of time,

2. Repeated coverage at regular intervals,

3. Large amounts of information from widely distributed points,

4. Synoptic, long range viewing to bring out subtle geophysical features,

5. Versatility of positioning of satellites, i.e., sun synchronous orbits operating at constant sun angles; or geostationery orbits operating at fixed points above the earth, or variations of these,[39]

6. Ability to hook in data processing and interpretation facilities at the same time as information is gathered.

A few disadvantages may be mentioned as well:

1. Launch preparations require decision well in advance,

2. Instrumental failure may cause the entire mission to be of no value, at great cost,

3. If in polar orbit, monitoring can take place only for a short time every day,

4. If clouds are present, optical measurements cannot take place on the ground.[40]

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[37]MIT, supra note 34, at 171-172.

[38]Id. at 174-175.

[39]NASA, supra note 5, at 40-42.

[40]Supra note 6, at 12.

With respect to earth resources, the prospect of remote sensing is somewhat clearer than it is for the environment. Several obvious reasons account for this. One is that the reasources are in tangible solid or liquid states, easier to take pictures of in the visible position of the spectrum, rather than in dispersed gaseous or chemical states. A second reason is that ground and air surveys of crops, forests, sea state, ice hazards, oil slicks, water courses, geological formations and mineral deposits have already given us basic experience and control data for drawing conclusions, which can be applied to satellite sensing. Finally, the prospect of economic reward, connected with resource matters, presents a stronger incentive than the avoidance of only partly felt hazards offered by environmental monitoring, even though the latter may be more urgent.

Earth resource survey system uses are customarily subsumed under the following headings: Agriculture; Forestry; Geography and Cartography; Geology and Mining; Oceanography; Hydrology and Transportation, Navigation and Urban planning. Naturally the number of particular uses expands with each new project, real or imagined.

Agricultural applications include: collection of data to estimate and increase crop yields and quality; increase amount of land under cultivation; reduce crop losses due to weeds, pest and disease; detection of plant water stress; detect shallow and droughty soil; indicate occurrence of rainfall; measure soil temperature; study occurrence of freezes; detecting spring and subsurface flow; and monitoring thermal pollution.[41]

Forestry applications include: forest and range inventory of tree types; boundaries; mapping and estimate of logging yield; detection and characterization of stress symptoms in forest vegetation; and forest fire and disease detection.[42]

Geography and Cartography uses include preparation of new maps for areas already surveyed and the surprisingly large (50%) land area of the world still unsurveyed, including exploration of the Arctic and Antarctic.[43]

Geology and Mining relevances include: terrain mapping; discrimination of rock types and properties; discovery of new energy supplies such as petroleum by sorting out geological and geophysical conditions and locating minerals on land and continental shelves; prediction of natural disturbances such as earthquakes, landslides and volcanos; detect geological changes such as erosion and data formation; also geothermal power sources.[44]

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[41]Park, *Aerospace Applications in Agriculture and Forestry, I Space Exploration and Applications,* UN Doc. A/Conf. 34/2 at 615; Wiegand, Agricultural Applications and Requirements for Thermal Infrared Scanners, 2 *Proceedings of the International Workshop on Earth Resources Survey Systems* 67-68 (1971), [hereinafter called *Ann Arbor Workshop*].

[42]Id. at 83-194.

[43]Siebert, Space Applications in Support of Cartography and Geography, *I Space Exploration and Applications,* UN Doc A/Conf 34/2 at 630.

[44]Recora, Geological Applications of Earth Orbital Satellites, id. at 634; *Ann Arbor Workshop,* supra note 41, at 323-428.

Oceanography benefits listed are: exploration of marine resources—sediments; location of plankton; determination of upwelling water sites leading to favorable fish areas; study of water and wind circulation; forecasts of sea state and ice hazards for shipping; survey of coastal geography; and the location of oil and gas deposits on the ocean bottom.[45]

Hydrology uses include: detection of snow fields and snow cover particularly in remote areas; river flow rates; irigation and drainage patterns; monitoring of soil moisture and vegetation conditions; and detection of floods and droughts.[46]

Transportation, Navigation and Urban Planning applications embrace: mapping of rural and urban areas to plan traffic arteries and terminals; surveys of urban areas for housing population densities, park areas, industrial development for renewal and building programs; and mapping of water courses and sea traffic.[47]

It is essential to bear in mind that a great number of these uses have not been put into practice or compared on a cost basis with existing non-satellite applications. In fact, it has been suggested that the benefit estimates made for ERTS systems in past studies have been unrealistically high.[48]

Application of Remote Sensing to Particular Variables

Environment Variables:

It may be useful to indicate briefly the utility of satellite sensing to particular ecological variables:

1. *Carbon Dioxide in the atmosphere.* Carbon dioxide release has been increasing since the industrial revolution. Great amounts are injected into the air by the combustion of fossil fuels. Other sources are its release or take up of CO^2 by the oceans and changes of earth's biomass, in this case the depletion of forests. Carbon dioxide traps and absorbs heat, and radiates a portion of the thermal energy back to the earth's surface, the amount

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[45]Sherman, Space Craft Oceanography, etc., *I Space Explorations and Applications,* UN Doc. A/Conf. 34/2 at 648, 654; *Ann Arbor Workshop,* supra note 41, at 431-530.

[46]*Ann Arbor Workshop,* supra. note 41, at 431-530.

[47]*NASA, Satellites at Work* 25 (1971).

[48]Heiss, Estimating the Economic Benefit of Surveying Earth's Resources, *Proceedings of the Princeton University Conference on Aerospace Methods for Revealing and Evaluating Earth's Resources* 18.1-18.13 (1970).

of warming dependent in part on water vapor concentrations.[49] What is at issue here is the long term effect on climate and the production of green plants needed to sustain life. To forecast this effect, a long lead time in data collection is required. Present data collection in CO^2 has been continuous from 1958, based on estimates and observations of industrial production.

Ground based stations are capable of monitoring long term trends, but global measurements of CO^2 distribution from its sources to its sinks would be invaluable. They are not yet possible by satellite. Space photography would be good for high resolution data, in both the visible and infrared spectrum. Optical correlation instruments could also be used, judging the absorption of particular wave lengths of sunlight in the 2 u m to 20 u m infrared range by CO^2, as the sunlight passes through the atmosphere. Correlation with ground stations would be mandatory.[50]

2. *Particles and Turbidity of the Atmosphere (Aerosol Content).* Particles of all kinds—dust, liquid, and solid chemicals, are spewn into the lower atmosphere. The great volume, perhaps 90%, thrown up by volcanos, or carried windward from deserts, have a natural origin. The rest, in increasing volume, are man-made. They pollute soil, buildings and materials, increase respiratory illness, stunt plant growth, and help cause rain, haze and fog. Sulfates and nitrates are the most objectionable chemical aerosols.

One feared long range effect is that aerosols may alter the climate by changing the radiation balance of the earth. Following this script, the particles screen out sunlight, decreasing atmospheric transparency, increasing earth's albedo, and causing a decrease in mean temperature. There has in fact been a temperature decrease of 0.3° in the last 25 years, but this drop cannot be positively connected to particulate matter.[51] It is estimated that a decrease of total of atmospheric transparency of only 3 or 4 per cent could lead to a reduction of surface temperature of $0.4^{\circ}C$, very close to that required for a new ice age. This could be accomplished by an increase by only a factor of 4 in global aerosol background.[52]

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[49] An increase of 10% of CO_2 would lead to a warming of $0.2^{\circ}C$ assuming a fixed concentration of water vapor, albedo, cloudiness, radiation. A change of 6° either way would be dangerous. leading to melting polar ice caps, or, the other way, to a new ice age. McDonald, Pollution, Weather and Climate, *Environment, Resources, Pollution and Society,* 1971, at 328-332, but one recent report indicates that the rate or warming diminishes with increased CO_2 because of saturation of the 15 UM CO_2 band which traps infrared. Rasool and Schneider, Report, *Science Magazine,* July 9, 1971, at 138-141.

[50] MIT, supra note 34, at 193; SCOPE, supra note 32, at 27, 31; NASA, supra note 5, at 7-8. 66.

[51] In fact, the $0.3^{\circ}C$ thermometer fall halved a 0.6° increase which took place between 1880-1940 AD. Particulate matter also causes cloud formation, further blocking solar radiation. Contrarily, smaller particles affect outgoing long wave radiation, warming the air. The net effect depends on abundance, size, distribution, altitude and range of the particles.

[52] Rasool and Schneider, supra note 49; McDonald, supra note 49, at 332-333.

There is a lack of detailed knowledge of aerosol scatterings, their optical properties, and their spatial and temporal distribution. In order to measure and identify aerosols, mathematical models must first be worked out and tested against aerosols whose characteristics are known.

Monitoring aerosol content then becomes a must. One of the best ways is "by standing off in space and looking at the earth as a whole", that is, by registering the whole earth albedo. Ideally, measurement of solar radiation should also be taken from a few remote "clean" sites and from many scattered sites, and the results compiled. Albedo satellites would be indispensable for long term measurements, despite the problem of signal to noise ratio. They would use flux sensors in different orbits to detect the ratio of outgoing to incoming solar radiation. Satellites could also monitor particles, in the higher altitudes, as lower altitudes are beset by scattering, clouds, and very rapid changes. For particulate matter, NASA recommends photometers, which measure light intensity, photopolarimeters and infrared spectrometers.

The atmospheric turbidity itself may be sought by laser-radar (LIDAR) which would monitor the distribution of particles loading well into the stratosphere, perhaps replacing aircraft sampling. Selective narrow bands in the visible and ultra-violet spectral regions (0.50 and 0.30 microns) would be scanned for total turbidity. It is doubtful that the *lower* atmosphere can be satisfactorily monitored by satellite.[53]

3. *Air Pollution*—Because of variations and rapid changes of the lower atmosphere, present techniques do not indicate a large role for satellites. Satellites may well search out pollutants in the upper atmosphere, where conditions are much more "integrated" and more apt to reflect global changes.[54]

a) *Carbon Monoxide*—Toxic concentrations exist only locally, close to sites of emission, and the steady atmospheric content of CO indicates a removal process in the stratosphere. If so, the ozone necessary for ultraviolet shielding may be affected. No instrumentation now exists for remote measurements of carbon monoxide[55] but the distribution may be determined by thermal emission or by absorption techniques development which are underway.[56]

b) *Hydrogen Sulfide and Sulfur Dioxide*—Hydrogen Sulfide (H2S) oxidizes after 2 days to sulfur dioxide (SO2). Sulfur dioxide changes to sulfuric acid aerosol or particulate sulfate; sulfur dioxide causes damage to plants by adding acid to rain. Long term

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[53]Supra note 6, at 15-16; SCOPE, supra note 32, at 28; NASA, supra note 5, at 29-35 and 210-229; MacDonald, supra note 49, at 332-334; MIT, supra note 34, at 200-204.

[54]Supra note 6, at 15; North, supra note 14, at 296.

[55]MIT, supra note 34, at 211.

[56]NASA, supra note 5, at 10.

collection of air samples is indicated at present[57] for low level contamination. Satellites carrying radiometers, interferometers and optical correlation instruments may measure movement and burden of SO2 in the troposphere, and in ultraviolet and reflected solar infrared radiation. It is not currently feasible to detect H2S by satellite.[58]

c) *Ozone*—Ozone (03), an isotope of oxygen, protects organic life, including man, against ultraviolet radiation. Its present concentrations are desirable. It is already being monitored continuously by ground stations and by Nimbus III and IV satellites using radiometers, optical correlation instruments and spectrometers.[59]

d) *Nitric Oxide and Nitrogen Dioxide*—Nitrogen compounds, among them nitrogen oxide (NO) and nitrogen dioxide (NO2), are produced both naturally and by combustion of fossil fuels. They interact with other substances to form smog, and may possibly interfere with ozone balance. Measurement of the profiles of these gases have been made by high altitude balloons and may be taken by satellites, again with interferometers and spectrometers.

e) *Other gases*—There are as many gases as there are gaseous elements. Most often mentioned are methane (CH4-natural), other hydrocarbons, and ammonia (NH3) which might also be categorized as a nitrogen compound. None are as yet known to contribute serious hazards, and satellite techniques have not been yet developed but would be useful when available.[60]

To sum up: at this point of time, a global monitoring system using satellite-borne instruments as a prime tool is necessary to follow large scale climatic changes, but its utility in monitoring specific pollutants, particularly in the lower atmosphere, is limited.[61]

4. *Water Pollution including Thermal Pollution—The Oceans*

Sufficient data is now known to determine the perilous point of ocean pollutants on natural recycling mechanisms. As to local water bodies, such as Lake Erie, the effects are more than obvious.

Baseline sampling of ocean water always exists, and chemical analysis is well developed. An expanded number of sampling stations has been recommended, for surface and shallow water and for major deep water systems.[62]

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[57]MIT, supra note 34, at 206.

[58]NASA, supra note 5, at 8-9; 68-69; 100-110.

[59]MIT, supra note 34, at 207; NASA, supra note 5.

[60] MIT, supra note 34, at 204-207.

[61]Supra note 6, at 16-18.

[62]MIT, supra note 5, at 19-21; 123-131.

Among major pollutants are: oil, suspended sediment, chemical and toxic waste (including biocides, detergents, and chemical by-products, such as lead, mercury, other metals), solid wastes, including sewage, thermal effluents, radioactive wastes, nutrient wastes (phosphorous and nitrogen), and some living organisms.

The number of pollutants that can be *directly* detected in water by remote means is not large, as water responds to electromagnetic radiation in only a narrow spectral region (0.5 um). Some pollutants can be fingered from space, such as oil spills and large scale thermal emissions, but the optical inertness of many pollutants is a handicap. Many dissolved chemicals have no discernible remote signature, while some pollutants discolor water on the surfaces, and others have spectral signatures. The depths of the ocean cannot be adequately monitored by satellite, but some subsurface pollutants can be detected, if only in the visible and near visible region of the spectrum.[63]

Though pollutants move more slowly in water than in air, there is much mixing, rapid disappearance and local variations dependent on water movement. A satellite system is not suited to watch *local* water emissions; in particular, the 17 day repeated coverage planned for ERTS A/B is too long for local monitoring. A future satellite properly instrumented may, however, be suitable for this. The contrast between horizontal masses of water is weak, but there is much less mixing in a vertical plane. However, in deeper water, pollution particles would disappear into the "sink." Atmosphere scattering impairs the contrast of optical signatures and further handicaps reception.

Thermal pollution, where the radiation springing from the water is larger than the reflected sun radiation, is a very good subject for satellite detection on infrared sensors. Ninety-five per cent of energy comes from a surface layer—1/10 of a millimeter thick. One obvious use is monitoring heat levels from thermal discharge of nuclear power plants.

It may never be possible to record low level concentrations of chemical compounds in water by remote satellite sensing because, as indicated, solar radiation penetrates water only in a portion of the visible wavelength. However, since this same light stimulates organic production, the measurement of algae content is a good indirect indication of pollution load. The spectral signature of phytoplankton in the deep ocean may indicate where fish flourish, while its flowering near shore may indicate blooming sewage and waste pollution.[64]

Oil Pollution

Surface pollution and circulation from oil slicks and foams are favored targets for remote sensing. Natural oil sources may account for one-half the oil in the water; of the

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[63]NASA, supra note 5, at 19-21; 123-131.

[64]Supra note 6, 19-20; NASA, supra, note 5, at 125-132.

other half, man-made petroleum products emitted to air, later reaching the sea surface, account for 90%, while only 10% is attributable to accidents. This form of pollution is likely to grow.

Thermal infrared imaging systems, and microwave radiometers would be the proper instruments to detect oil spills. Radar systems have already been used. The location of oil flows can be adequately monitored, but the sources cannot. This requires physical capture and chemical analysis.[65]

Suspended Sediment

City building has shifted soil water basins, disturbing estuaries and salt marshes with dredging, tailings and fillings. Discolored water masses are clearly visible from space and can be examined over broad areas and extended time period. Mapping ocean water clarity by black and white and spacecraft color photography has already been studied in the Gemini flights, and a global map of ocean water turbidity was constructed. About 35% of the world's coastal sea floor can be mapped out to 20 meters' depth. Infrared photography has been tested successfully from aircraft to scan the effect of dredging. Spectrometers are potentially useful for determining particle size distribution and types, while new electro-optical systems have been mentioned for distinguishing the various suspended materials. Obviously, sampling would be more certain.

Chemical and Toxic Wastes

Untreated wastes have been dumped into oceans, lakes, streams and ponds from time immemorial, but the quantities have now reached a danger point. They have been joined as major pollutants by biocides, like DDT, which become concentrated in organisms and imbedded in the food chain. Detergents, fertilizers and manufacturing waste chemicals add to the toxicity.

Remote sensing is not efficient to directly sense specific pollutants, i.e., lead, mercury or DDT, either because of low concentration or lack of characteristic spectra. The possibility exists that indirect sensing may assist in identification. NASA lists the spectral contrast between clean and polluted water; differences in temperature between them; and the destructive effect on plankton, as identification aids. NASA concludes however that "this type of monitoring will probably only indicate that a problem exists, but will not in general, make it possible to identify a specific substance in the effluent." Sampling is primary, while an integrated network of satellite interrogation sampling stations would be a serviceable asset.[66]

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[65]MIT, supra, note 34, at 213: White, Remote Sensing of Water Pollution, *Ann Arbor Workshop*, supra note 41, at 303-304.

[66]NASA, supra note 5, at 141-143.

Solid Wastes

Sewage causes eutrophication, lowers water quality and spreads disease and shellfish contamination. Man depends on oceans for fish, and there is danger that global fishing output will decline. The Baltic and Mediterranean seas are in a bad way.

Sensing by aircraft or spacecraft may give a synoptic view of treatment plants. The sources and movement of effluents may be traded. A scanning spectrometer has been tested in aircraft to determine concentrations of solid wastes and distinguish among wastes. Thermal infrared sensors can monitor waste discharges day and night. By collating information collected over a time period, trends can be ascertained.[67]

Thermal Effluents

Industrial processes and burning of hydrocarbons discharge heat into water courses and air. Proliferating nuclear power plants will add to coastal water heat. Commercial radiometers in aircraft already stand sentinel on a regular basis. Satellite borne infrared sensors would be able to provide thermal maps of sea surfaces. The improved TIROS satellites have already mapped the Gulf Stream, and in 1970 the New York State Atomic and Space Development Authority completed by aircraft a two-year "heat picture" of major water bodies of New York State, so as to aid in the choice of locations for new power plants and monitoring their discharge.[68]

Radioactive Wastes

The contest between fossil fuel and nuclear field has not yet been resolved, but the depletion of fossil fuels will probably spell victory for nuclear energy. The result will end in radioactive waste, which must be strictly contained and disposed of. If nuclear fusion power plants rule sway in "large seacoast agroindustrial complexes", radioactive tritium will pose a danger to living tissue.[69]

Airborne scintellation detectors have detected radioactive emission on the ground from an elevation of 200 meters, once cosmic and other rays have been tuned out. Remote sensing has also tested radioactivity at the site of an underwater nuclear detonation. However, remote sensing by satellite of ground radioactivity is not possible.[70]

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[67]Id. at 145-147; White, *Ann Arbor Workshop,* supra note 41.

[68]NASA, supra note 5, at 147-154; White, *Ann Arbor Workshop* supra note 41, at 304-305.

[69]Cook, Ionizing Radiation, *Environment,* supra note 49. at 254-277.

[70]NASA, supra note 5 at 24, 152-154.

Nutrient Wastes

Inorganic nutrients, such as nitrogen and phosphorus, are fertilizing elements which participate in photosynthesis of plant life on land and sea. In open oceans where the supply of nutrients is low, near the shoreline, levels are higher because of run-off from land of natural and human products, such as agricultural fertilizer runoff, detergents and industrial wastes. An excess of nutrients can cause eutrophication of a body of water, the overgrowth of marine plant and animal life which depletes oxygen and kills beneficial life forms. As in the case of chemical wastes, nutrients cannot be remotely sensed, but chlorophyll measurements can indicate the presence of enrichment, through appropriate radiometers and spectrometers.[71]

Other Water Bodies—Living Organisms

Much of what has been said of ocean pollutants apply to other water bodies. Because many lakes, streams, rivers and ponds are small, they are of local or national rather than international concern. Monitoring by satellite would be inefficient or too costly.

Larger bodies of water, the larger rivers and lakes, might be monitored. They are more subject to changes caused by invasions of living organisms and other ecological disturbances. Lampreys introduced into the Great Lakes decimated lake trout. Lake of salt in the Back Bay bird refuge in Virginia prevented precipitation of silt which in turn screens sunlight from a plant food source vital to water fowl.

Many biological phenomena may be detected remotely, by multispectral photography. Laser systems can detect bioluminescence.[72]

Monitoring Terrestrial Ecosystems

An ecosystem is a system formed by the interaction of a community of organisms with the environment.

In the earlier discussion of resource monitoring, various individual applications were touched on. The dynamics of these sources becomes at some point an ecological matter.

The significance of taking spectral signatures is that they can be stored in magnetic form and saved for comparison with others. The collection and study of signatures must be exhaustive, because the signatures are continually changing depending on external changes like radiation and weather and internal changes in the object itself such as water content and aging. Laboratory studies of the relation of the sensor with the signature of

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[71] Id. at 24, 154-156.

[72] Id. at 25, 156-160.

the objects are fundamental. Studies are then done in the field. The sum of these studies in the laboratory and in the field is "ground truth", with which the results of satellite sensing must be compared.

Satellite Multiband Spectral Scanning can map, classify and evaluate different terrestrial ecosystems. This has been proceeding for some time, particularly in agricultural surveys. Ecological *monitoring* goes one step further—it is the search for *change* in these systems. In order to detect changes, one must know what to look for—and this is difficult because there is not enough knowledge of the relationships within and among ecosystems. Change may be exposed by monitoring of variables—instability of agricultural land as manifest by pest increases, for example. But many of these variables either make no impression on remote satellite sensors, or, the coverage and regularity of surveillance is not sufficient.

In some marginal areas however, ecological stress, such as locust breeding in desert areas, or lemming explosions in arctic areas results in changes that are detectable. One good variable of global monitoring would be vegetation boundaries in marginal areas. As stated by Dr. Bengt Lundholm to the United Nations:

> The necessary technique is available and ready to be satellite-borne. The different types of vegetation are registered both in the visible and near infrared bands. Here monthly and even less frequent records, would suffice, and satellites in polar orbits with a 17-day repeated coverage would be sufficient even in the northern areas with extensive cloud cover. Another argument for using satellite recording in these areas is that they are remote and very inaccessible.

Mr. Lundholm asserts that the first step is the organization of ground truth research on an international level. This would call for an international pilot team of experienced scientists in marginal areas.[73]

Data Processing and Information Dissemination

In ascending order of our hierarchy, remote sensing by satellite is one technique of remote sensing, which itself is only a portion of a larger activity—monitoring the environment. And environmental monitoring itself may be considered a facet, but a large one, of the entire objective—environmental management. A similar hierarchy exists as to resource management.

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[73]Supra note 6, at 17; 28. There are already in being 33 major international monitoring programs, current or planned coordinated by 16 intergovernmental agencies and organizations that involve 135 countries. There are also 2000 environmental monitoring activities, programs and systems, employing upwards of 20,000 ground observing, monitoring and sampling sites, stations and platforms, in 146 countries, territories and ocean sites of the world. Four important programs are global in scope: the World Weather Watch (WWW); a Sun-Earth Environmental Monitoring Program; the International Biological Program (IBP); the International Hydrological Decade. See Citron, The Establishment of an International Environmental Monitoring Program 3-5 (1970). SCOPE, supra note 32, at 54-60.

The end result of all monitoring, whether of the environment or resources, is acquisition of information. And not merely information, but useful information, which can be the basis of action.

The collection of useful information is not a static thing. One has to know what to look for, and what to do with information when it is obtained. There is constant shuttling back and forth between the input and output sectors of monitoring.

In ecological matters, predictability is essential. The science of modelling (simulations) may be used to compare data obtained with data expected, and therefore to determine what next steps are required in the way of information gathering. These next steps might be the acquisition of "ground truth", data from on site locations, deciding what new projects should be started and what satellite missions, sensors and orbits are needed.[74]

Much information is received in the form of large amounts of photography. These photographs must be interpreted by people, and conclusions drawn from the pictures themselves and by comparison with other pictures and other information.

Other information is received in other parts of the electro-magnetic spectrum. With multispectral scanners, for example, the signatures for one type of object obtained in a variety of conditions (the temperature, atmospheric conditions, precipitation), is separated from signatures of other types of objects. These signatures in all parts of the spectrum are registered on tape recorders. A large amount of information is obtained, with the consequent need for data processing.[75]

The data, to be useful, has to be collected, processed, analyzed, stored, retrieved, extracted and applied. How this is done obviously depends on the sensors that are used and data processing techniques available at any time. These same considerations apply to earth resource surveys. In the case of resources there appears to be greater reliance on photographic information in the visible spectrum.

Data Collection

Data collection must be scheduled on a planned basis and must be controlled in relation to orbital parameters and user requirements. User requests for data and ability to check current image holdings must be assured.[76]

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[74]*Castruccio, The Role of Earth Satellites in the Study of the Human Environment,* Un Doc. A/AC.105/C.1/VIII/CR Page 2, March 9, 1971, Page 8-17.

[75]Supra note 6, at 11.

[76]The bulk of the following discussion is adapted, with thanks, from Mumbower, Ground Data Processing Considerations for Earth Resource Information, *Princeton U. Conf.* supra note 48, at 8.1-8.26; and *Castruccio,* supra note 74, at 38-47.

Data Processing

Among tasks lying in wait for processing personnel are: film processing, assessing quality, purging unacceptable data, cleaning up, titling, converting analog data to film, digital form on hard copy plots, and feedback to the sensors to pursue or complete the objectives of the mission.

The sensor outputs tend to fall into three different categories for processing:

a) High resolution films. Optical and mechanical processors develop the films. Some data is processed digitally (into computer numbers representing the variables).

b) Medium resolution imagery from telemetry. Analog tapes are converted to film. Some is processed digitally.

c) Low resolution imaging and non-imaging sensors processed digitally.

Storage Retrieval and Dissemination

Computers can rapidly search and retrieve data in support of queries and dissemination of data to users. The indexes are physically separated from the images, but with linkages to identify the frame desired.

All variables may be assigned different mathematical quantities for retrieval; features on earth can be given locations based on any of several coordinate systems (i.e. latitude and longitude) and also described as geometric shapes. The information can be retrieved by describing the variables desired, and feeding the description into a computer. An index, also computerized, can be based on auxiliary data (date, scale, time, altitude of camera, type) combined with geographical information. Data obtained independently of sensors would be combined with information derived from sensors.

A schematic diagram of the flow of information in an Earth Resource Survey System is attached as Fig. 2.

It would be possible to incorporate the indexes of various agencies into a central library and to incorporate pertinent indexes into local libraries. The central system would disseminate data, answer inquiries, and publish summaries of acquired data.

SCOPE urges an international environment data center or centers for each country. The resulting information would be made available to the scientific community on a monthly, quarterly, or longer basis depending on need. A Central Monitoring Coordinating Unit would oversee international publication of data and maintain a central data library. The central library could be lodged in one large facility or preferably stored in several dispersed centers. Several such centers were established for the International

Geophysical year. The World Health Organization has storage facilities for key health data.[77]

Data Extraction

Data extraction is the most difficult part of a data processing system. Data must be analyzed to produce information in a format amenable to use. This requires the intervention of human intelligence, because much data is irrelevant and must be separated from relevant data.

This involves four distinct activities: detection, identification, analysis and communication. Fully automated approaches to image extraction have not been developed to substitute for human flexibility.

There are several systems that assist human interpretation.

These are:

– Image viewing and manipulation, including optical projection techniques, microscopes, stereoscopes and cathode-ray tubes.

– Automatic measurement of objects can be accomplished automatically by computers directly connected to the image viewing devices.

– Information retrieval techniques utilize computers. Known information is retrieved from files describing objects and features, new data is collated by roll and fame number with older files on the same subject.

– Reporting and graphic preparation techniques use maps, graphs and digital scanning devices.

Other techniques are still under development. They all involve storage in electronic form of as many characteristics of an object or phenomenon under study, so that identification can be made of similar objects or phenomena in the least time. It is the writer's impression that data processing of environmental variables is somewhat more difficult than for resource variables.

Legal Aspects of Environmental Monitoring and Earth Resource Surveys by Satellites

This paper will not study the question of international organization of satellite monitoring, as this is the subject of other papers.[78]

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[77]SCOPE, supra note 32, at 53-54.

[78]The writer has dealt with this subject in New Developments of Earth Satellite Law, 65 *NW. U. L. Rev.* 759-779 (1970).

The immediate and most striking impression one takes away is the technical nature of satellite monitoring. The subject matter ultimately resolves itself to abstract mathematical, physical and mechanical concepts. This means that only a relatively few people are able to understand the scientific problems of the environment, the methodology of monitoring, and the apparatus involved.

Intricate technologies are not new. Space flight and nuclear energy are complicated matters. (This has been reflected in the controversy over ABM system and current nuclear vs. fossil fuel polemics.) But ecology draws on all scientific disciplines, involves the whole world, and is intertwined with all of man's significant activities.

Arching over the entire subject is the destiny of man on earth and in the universe. Should man adopt an "extraterrestrial imperative" using technology to grow indefinitely, exploiting resources beyond earth as well as those on earth and finally becoming independent of earth?[79] Is he required peremptorily to stop all economic and population growth to avoid collapse under the weight of food shortages, raw material depletion and pollution?[80] Or is there some middle ground?

Admittedly, remote sensing of the environment by satellite is a small part of the entire topic, but it may be a significant part. Who is to make the decision, say, that the use of fossil fuels be curtailed, or that aerosol emission be drastically limited?

Obviously, the nominal decisions will be taken by antional leaders. They will be influenced by general public opinion, and by the acts and opinions of their peers in other countries. But perhaps the most important influence will be the facts and opinions marshalled by the scientific community.

It is important therefore that the scientific community itself obtain the correct facts. It is important that the most effective and accurate modes of monitoring be chosen, that the right questions be asked, and the responses evaluated.

In the case of resource development, the need for precision (detection of conditions for fish schools by plankton content) is not quite as vital because not too much is lost. In the case of environmental monitoring (long-term changes in plankton content to indicate irreversible ocean pollution), accuracy is critical.

There are, of course, other types of remote sensing besides satellite sensing, and other types of environmental monitoring besides remote sensing. This will generate tension between competing groups, which may affect objectivity in the choice of monitoring modes.[81]

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[79] Ehricke, The Extraterrestrial Imperative, New York Times, March 31, 1972, at 29, Col. 5.

[80] *Meadows, Limits to Growth* (1972).

[81] Supra note 6, at 34, 36.

The legal framework that is erected for environmental monitoring must therefore avoid monopoly by one single group of experts. This means that there must be a variety of inputs in which the conclusions of one scientific circle are anatomized by another. It has been suggested that recommendations for executive action by one group of monitors run a gauntlet of two further processes of evaluation. The first review would be by an organization linked to the monitoring system which is also an independent body representing the international scientific community and all relevant scientific fields. It would take account of political, sociological, economic, legal and other sciences. The second review would be by the ultimate user—a national government or international agency.[82] SCOPE recommends that each government, UN agency or other inter or non-governmental body set up a committee (a Monitoring Office) to communicate and receive data relevant to a global system. It would also coordinate intra-national monitoring activities, standardize samplings and measurement techniques, train and exchange scientists and technicians and have access to data banks. The global system would consist of a Central Monitoring Coordinating Unit established by international agreement to delineate and review programs, provide data handling and dissemination, evaluate device from its independent scientific advisory body, UN agency, and others. The International Council of Scientific Unions would arrange for scientific assistance in the evolution and design of the global environmental monitoring system and in analysis and interpretation of data. Finally, a UN connected body would further coordinate, integrate and define policy for all international, governmental, intergovernmental and non-governmental environmental programs and affairs, apart from monitoring.[83]

There is another reason in favor of centralization—apart from the uses of international organization as an aid to peace. If changes in industrial life style do prove necessary, it will be easier for individual nations to make these changes if other nations likewise agree to make these changes. Unilateral de-industrialization is no more likely than unilateral disarmament.

It is not likely that technology will be abandoned forthwith. But technology may take new forms. Fossil fuel use may be phased out in favor of nuclear fusion. Or both may be replaced by hydrogen as a fuel and solar energy as a source of power. It may even eventually be decided that the endless generation of sizeable artifacts—nuclear, submarines, giant tankers, missiles and bombers, will have to abate. If so, this would be possible only if all major nations were convinced of the necessity of self-denial, and agreed to limit their outputs. One nation is not likely to forego the trappings of metalware power or population power if another retains this power. A communality of ecological knowledge would make mutual adjustments easier.

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[82]Id. at 34-37.

[83]SCOPE, supra note 32, at 64-65.

Overflight

There is no distinction between manned or unmanned satellites, space stations, remote sensing satellites, whether for resource survey purposes or environmental monitoring purposes. All are objects launched into outer space within the meaning of Article VIII of the 1967 Space Treaty.[84]

It is generally accepted that there has been no official protest against the overflight by satellites in orbit for peaceful purposes over the territory of the subjacent state, that this overflight is in areas not considered airspace, and is legal. The rule, then, is that a state may place a satellite in orbit for peaceful and scientific purposes without obtaining the consent of any other state to its orbital flight per se.[85]

Satellite Uses

Military

Both the United States and the Soviet Union have used remote sensing devices to detect military installation of other States and to monitor the flight of their own missiles and those of other States. The Space Treaty bids space activities proceed in accordance with international law and for international peace,[86] but does not ban uses for military surveillance.[87] Though the Soviet Union has verbally stated its objections to satellite collected intelligence from State territory[88] it has not pressed any official objection. The principal application to space surveillance has not been defined by the United Nations Charter, other treaties or international custom, and there is no positive rule of international law banning it. Accordingly, under the Lotus rule,[89] one may say that such activity is permitted.[90]

The same instruments carried by environmental satellites and resource survey satellites can be used for military purposes: photographs of installations, roads and

[84]Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, done January 27, 1967, TIAS No. 6347 [hereinafter cited as Space Treaty].

[85]*Lay and Taubenfeld, The Law Relating to Activities of Man in Space* 73 (1970).

[86]Space Treaty Article III reads: "State Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding".

[87]On celestial bodies, military bases, installations, fortifications, weapons' testing and military maneuvers, are forbidden. Supra note 84, Art. IV.

[88]Crane, Soviet Attitude Toward International Space Law, 56 *Am. J. Int'l. L.* 685, 704 (1962).

[89]Case of the S. S. "Lotus", [1927] P.C.I.J., Ser. A, No. 10.

[90]*Vazquez, Cosmic International Law* 163-179, (1965); *Jenks, Space Law* 305-306, (1965); *Lay and Taubenfeld,* supra note 85, at 25-32; Brooks, supra note 78, 769-773.

waterways, rocket flights, sensing of nuclear power plants, etc. From the foregoing discussion of military surveillance, it is clear that environmental satellites and resource survey satellite overflights are not illegal merely because they are used or capable of use for military purposes.

Environmental Uses

There is likewise no legal ban to mere transit in outer space by the remote-sensing earth satellite across the borders of another State.

As distinct from mere transit, the use by a State of information gathered from land, water or airspace outside the territorial jurisdiction of any State is free from any legal inhibition.

The collection by one State of ecological data—from areas *within* the territory of another State—thermal emissions indicating nuclear fission activity, for example, likewise meets no legal objection.

States are continually collecting information with respect to other States. Diplomats, obtaining data while physically present on the soil of the host State, periodically relay this information to the receiving state. Other information gathering, such as reports of businessmen and scrutiny of written material emanating from a state, occur with monotonous regularity. There is no substantial difference between these actions and gathering information by remote sensing. The bulk of environmental sensing, moreover, is benign. If the data is helpful in detecting ecological dangers, no State should or would find fault with this surveillance.

In the example given above, the information of nuclear fission activity could have military and economic, as well as environmental significance. This does not alter the legality of such surveillance, since, as with military surveillance, there is no positive sanction against such practices.

Does a monitoring State have a duty to disclose the ecological information it discovers concerning the territory of another State? Obviously, no. Even as to facts constituting a danger to another country—a forest fire, thermal information indicating possible earthquake, drought conditions—there would appear to be no affirmative obligation to disclose. It is difficult, however, to imagine the government of any nation so lacking in morality as to suppress the critical news from the endangered country.

Article I of the Space Treaty requires parties to carry out the exploration and uses of outer space for the benefit of all nations, and Article III bids States carry on space activities in the interest of promoting international cooperation. These statements are generalities and import no concrete obligations beyond those of general international law. Example of such affirmative obligations would be those specified in the agreement on the

Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched Into Outer Space.[91]

The principles offered above as to environmental satellites activities apply equally to resource surveys by satellite. Nations may overfly, gather information from, use and withhold at will the tidings their sensors tell of other nations' crops, minerals, lakes and forests.

There may be one gloss to this set of norms. Under international law States bear responsibility for torts committed on the territories of other States[92] where the case is of serious consequences and injury is established by clear and convincing evidence.

One may suppose a case in which a corporation of one nation is given access to satellite information pinpointing the location of valuable chrome deposits on the territory of another State. Would it be a delict for the corporation, with the assistance of the government officials of the monitoring nation to clandestinely purchase the mineral rich land at a cost much below value? The answer is not clear. In such case an injury is being done to a State directly on its own territory, involving a tangible, specific res. This is something more than mere information gathering that may be used indirectly to the advantage of a collecting State. Additionally, the secretive and hurtful nature of the act would seem to fall below even minimum standards of "promoting international cooperation and understanding".[93] Another view is that the observing State would be subject to no enforceable obligation to share its knowledge in order that the nations could bargain on an equal basis, because the law concerning taking unfair economic advantage of one State by another remains at best embryonic.[94]

Obviously much has to be done in the way of preparation of international conventions to mandate compulsory dissemination of relevant information.

Short Term Prospects

The Scientific and Technical Sub-Committee of the Committee on the Peaceful Uses of Outer Space, established a Working Group on Remote Sensing of the Earth by

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[91]Done April 22, 1968, TIAS, No. 6599. Certain treaties, such as the International Convention for the Safety of Life at Sea, done June 17, 1960, TIAS No. 5780, UNTS 27, may be read to imply information exchange as to ocean areas. The bilateral agreements on cooperation between the Academy of Sciences of the USSR and NASA provide for exchange of meteorological and other information by satellite, but the choice of data to be exchanged is not compulsory. *International Legal Materials,* May 1971, at 621-625.

[92]Trail Smelter Arbitration, US Dept. of State Arbitration Series 8, at 36-37.

[93]Space Treaty, Art. III. Note the Latin-American Consensus of Vina Del Mar, insisting on the "sovereign right of every country to dispose freely of its natural resources". (Emphasis added, as having possible relevance.) International Legal Materials Sept. 1969, at 977-978.

[94]*Lay and Taubenfeld,* supra note 85, at 188.

Satellites[95] and the General Assembly has requested member States, UN and other bodies to submit comments and working papers to guide the new group.[96]

But ERTS, A and B is only an experimental program. Its purposes are to assess the practical value of remote sensing in space, to compare the capabilities of spacecraft and aircraft, to determine which remote sensors are most effective, to improve data handling procedures in terms of international use, and to insure full understanding of operational system requirements and costs.

ERTS A/B is therefore intended to be an inquiry as to whether and what rate to proceed with an operational system. Domestic user agencies (Dept. of Agriculture, Commerce, Geological Survey, etc.) will have first priority on information. The area of earth monitored will, primarily, be North America.

While other nations may read out the data as it is collected, the $4 million cost of ground stations in foreign nations, is likely to inhibit foreign use.

Until the results of this program are reviewed, it is difficult to predict the contour of future international participation. Obviously developing nations cannot afford elaborate electronic earth resources or environmental programs. The real need is for a centralized data processing and dissemination mechanism suggested to the Committee on the Peaceful Uses of Outer Space.[97]

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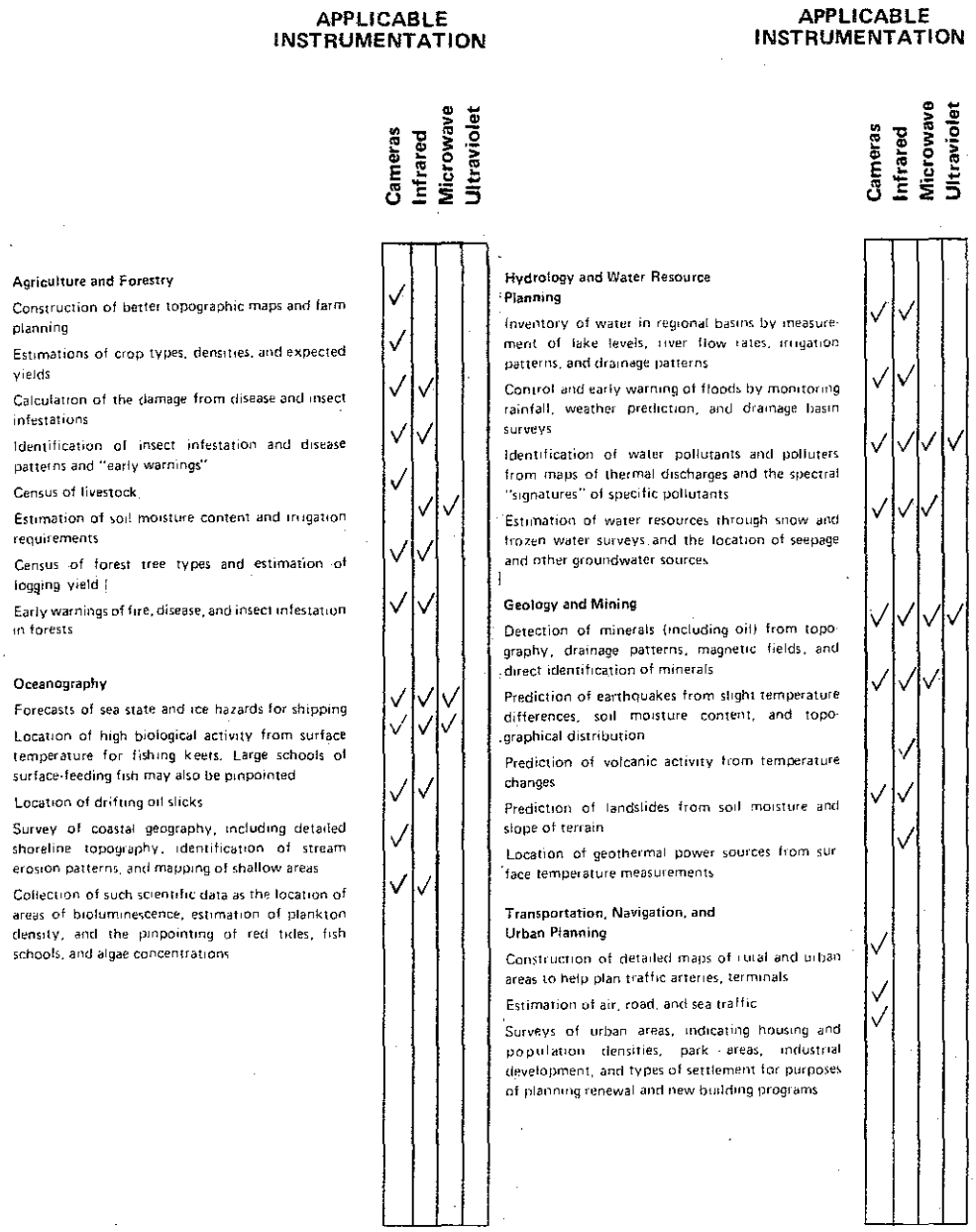
[95]UN Doc A/AC.105/95, July 19, 1971, page 4.

[96]A/Res/2778 (XXVI) December 8, 1971.

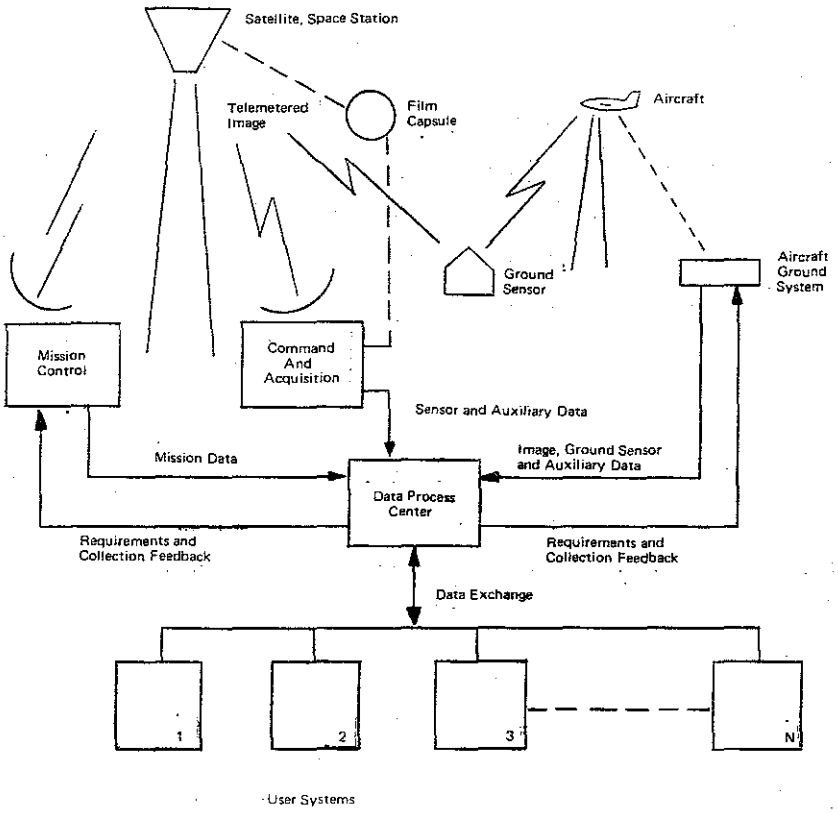
[97]Frutkin, Status and Prospects of International Earth Resources Satellite Programs, *Princeton U. Conference*, supra note 48, at 17.1-17.5.

PRACTICAL APPLICATIONS OF ERTS INSTRUMENTS



Source: NASA, Satellites at Work, 1971, p. 25.

Fig. 1



Source: North, *Remote Sensing of Environmental Pollution:* International Earth Resources Survey Systems, Ann Arbor Workshop, Vol. II, 1971, p. 308.

Fig. 2

AN INTERNATIONAL AGENCY FOR EARTH RESOURCES EXPERIMENTS

*George A. Codding, Jr.** and *Mohammed Beheshti***

The most recent addition to the man-made objects orbiting the earth is the space laboratory. This machine, which can be maneuvered in orbit by its resident astronauts to pass over any part of the earth's surface, is expected to offer man his best look yet at what is taking place on the planet that he calls home. The underlying thesis of this article is that this new space activity, if properly organized by the international community, can provide mankind with an extremely valuable tool for the solving of many of the scientific and social problems that are placing man's survival in question.

Basically, the space laboratory is a space vehicle large enough to house three or more astronauts for periods up to two months in duration. It must contain living quarters, provision for food preparation and waste management, and space for a number of scientific instruments for scanning the surface of the earth. The unmanned space laboratory is launched and placed in orbit at the desired altitude above the earth. The crew arrives subsequently aboard a conventional space vehicle, transfers to the space laboratory where it takes up temporary residence, and carries out the programmed experiments. The space laboratory can be maneuvered to enable it to pass over any part of the earth's surface for which information is desired. After the programmed experiments have been carried out, the crew returns to earth leaving the space laboratory in orbit around the earth. This process can be repeated almost indefinitely. Although the types of experiments that can be carried out during each period are restricted to a certain extent by the instruments that were originally sent aloft with the space laboratory, it is anticipated that later crews will bring some new instruments with them, thus permitting some flexibility.[1]

The real usefulness of the space laboratory in surveying the earth's resources is due to the development, in the second decade of the space age, of remote sensing devices.[2] Fundamentally, these relatively new "eyes" utilize electromagnetic radiation, characteristically emitted or reflected by all physical objects, to identify the nature of the objects in question and their location. This, combined with the speed with which the space vehicle orbits the earth, gives the space laboratory its uniquely valuable character. Ground and aircraft observations will, without doubt, continue to be used; but for many purposes the space laboratory is preferable.[3] As one example in discussing the cost of inventorying

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[1]See *Pecora, Surveying the Earth's Resources from Space* 9 2-15 (1969); See Also, Denoyer, Satellites for Observation of the Earth, 38 *Telecommunication Journal* 360-370 (1971).

[2]*Weaver, Remote Sensing: New Eyes to See the World* 135, 47-73, (1969). For a more detailed treatment of the subject, see Jamieson, Infrared Physics and Engineering (1968).

[3]*A. Vinogradova, Physical Principles and Technical Means of Aerial Surveying,* Report No. FTD-MT 24-316-68, Leningrad IZD-VD-NAUKA, Edited Machine Translation, 1968. See also *National Aeronautics and Space Administration, R. Bashe,* Report No. NASA-CR-1358 (1969).

ing timber, Jaffe and Summers report: "It has been estimated that the Apollo photography could reduce the required aircraft and ground data gathering by a factor of six."[4]

Among the experiments being planned for the United States space laboratory, to be called SKYLAB and scheduled for launching early in 1973, are: crop identification, mapping of the earth's surface temperature, soil moisture analysis, vegetation mapping, water pollution study, and identification of potentially useful land areas.[5] Other experiments include mapping of snow-covered lands, frozen and unfrozen ground, and seasonal flooding and rainfall. Still others are designed to give information on ocean characteristics such as surface roughness, wave condition, varying ocean surfaces, ice clouds, and the like.[6]

All of these experiments are important to an effective control and use of resources. For example, measurements of the amount of water stored in the form of ice and snow, and effective control of snowmelt runoff from such areas, would be of major importance in river flood and water supply forecasting as well as for successful water conservation and management programs. Successful exploitation of the sea floor and continental shelf requires more than hydrographic charting, which emphasizes only surface navigation and its dangers. For resource exploration and its effective management, a new kind of map is needed—one that will show sea floor topography and composition, water depths and ocean currents, marine life and its distribution. This information is needed both to identify sea resources and to provide for man's safety and efficiency while working within the ocean environment. Examples are endless and, although the Soviet Union has not made known the exact nature of the tasks that were carried out aboard the Salyut-Soyuz manned orbital laboratory launched in June 1971, it can be assumed that they are conducting similar experiments.[7]

One of the more interesting and valuable features of remote sensing is its possible practical application to social as well as scientific problem solving. The space laboratory can be used to make population density surveys, to find new locations for industry, to

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[4]Jaffe and Summers, The Earth Resources Survey Program Jells, 9 Journal of Astronautics and Aeronautics 24-40 (April 1971).

[5]Application of Remote Sensor Data to Geologic and Economic Analysis of the Bonanza Test Site, Colorado, First Summary Report, March 31, 1970. See Also, Lowman, Apollo 9 Multispectral Photography: Geologic Analysis. Report No. S64469423.

[6]A general review of all Skylab experiments can be found in Skylab Program—Flight Planning Study Report, NASA-MSC Report No. 00967 (1970). For a more detailed study of proposed earth resources experiments aboard Skylab, see Smith, Earth Resources Experiments Package Skylab Program, Report No. MSC 02953 (1970).

[7]"Both the Soviet and the American space programs place much emphasis on long-range manned orbiting stations." Such is the opening sentence of a recent Russian publication. See Dr. V. S. Vereshchetin, *USSR Academy of Sciences,* Moscow, *Legal Aspects of Orbiting International Laboratories* (1970).

plan transportation routes, and to find recreation sites. As regards man's environment, it can be used to monitor air, water, or soil pollution and as a precise new aid in weather forecasting. It can also be used to control man's environment by detecting floods, landslides, forest fires, volcanoes, and various types of agricultural disease. These features make the work of space laboratories useful to rich and poor nations alike. While the industrial nations might well concentrate on the too rapid use of the earth's natural resources and the pollution of the life-sustaining environment, the new and developing nations can emphasize the identification of their natural resources and their development in a manner which will provide for a decent standard of living.[8]

There are at the moment only two nations with the technological sophistication and financial wherewithal necessary for the building of space laboratories, placing them in orbit, developing the techniques necessary for remote sensing, developing the computer technology necessary to handle the mass of data to be transmitted from space to earth and, not least, converting the raw data into a useable form. While no one would deny these two powers the right to use their resources for their own benefit, it would still be a tragedy if the potential of the space laboratory were to be denied to other countries, especially those where the standard of living is so low as to be brutal.

Fortunately, the United States at least has demonstrated an awareness of the need to bring the benefits of space exploration of the earth's resources to others. The international aspects of space activities were clearly recognized in the Space Act of 1958, which designated a civilian agency to conduct the United States Space program and authorized it to engage in a program of international cooperation consistent with the intent of Congress. Section 102-A of the Act states: "The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind." Nine years later, in its report on the Post Apollo Program, the President's Science Advisory Committee concluded its presentation with this comment:

> Space exploration, space science, and space applications all constitute areas where international cooperation is particularly appropriate—NASA's own efforts toward international space programs should be expanded. In addition there should be continued encouragement to other agencies, notably the State Department, Arms Control and Disarmament Agency, the National Science Foundation and the National Academy of Sciences, to study and, where possible, actively support international programs in space, including the fostering of cooperative efforts through organizations such as the International Council of Scientific Unions.[9]

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[8]For a brief discussion of the application of space laboratories to the solving of social problems, see *Priorities for Space Research, National Academy of Sciences, Report of a Study on Space Science and Earth Observations Priorities* 108-128 (1971). See also *Orbital International Laboratory and Space Sciences Conference Proceedings, Cloudcroft, New Mexico,* September 1969. Demoret and Morgenthaler, The Large Earth Orbital Space Stations: An International Program 442-446 (1969).

[9]*Summary of Panel Report on Useful Application of Earth Oriented Satellites.* Malone, International Consideration in Space Applications 73, Contract No. NSR 09-012-909-1967, *National Academy of Sciences* (1969).

It is, therefore, not surprising that the Central Review Committee of the Summer Study on Space Application in its 1967 Interim Report noted that the international development of useful satellites offered "an array of remarkable opportunities, public and private" and recommended that the 1968 continuation of the study emphasize the international aspects of space application. President Nixon carried it a step further when, in a speech to the UN General Assembly in September, 1969, on U.S. intentions in space, he stated that: "This program will be dedicated to produce information not only for the United States but also for the world community."[10]

Other nations are aware of the potentials of this program. In June, 1970, the U.S. Government issued an Announcement of Flight Opportunity (AFO) designed to solicit methods of using the data to be obtained from the Earth Resource Technology Satellites (ERTS), non-manned satellites which are scheduled for launch in 1972 and which will serve as a preparation for the SKYLAB experiments to follow. Of the more than 400 letters of intent received, 70 came from individuals in thirty foreign countries.[11] The conference for potential investigation held at NASA's Goddard Space Flight Center in February of 1971 attracted many delegates from foreign countries, both developed and developing, as did the conference held at the University of Michigan late that same spring.[12] The stamp of acceptance of the concept of remote sensing as a potential valuable aid to development was given in August of 1971 when the Scientific and Technical Subcommittee of the UN Committee on the Peaceful Uses of Outer Space established a Working Group on Remote Sensing of the Earth by Satellites.[13]

The only major problem that remains is how best to bring about a workable marriage between the expressed U.S. desire to make the benefits of space laboratories available to the rest of the world and the apparent interest of other nations in availing themselves of those benefits. A solution to this problem, it should be noted, would also apply to the U.S.S.R. in case she should follow the lead of the United States and be prepared to offer other countries the use of her space laboratories.

One solution, would be for the United States to make the necessary arrangements on a purely bilateral basis. The United States could negotiate directly with the countries that expressed interest, making arrangements for the design and production of the desired experiments, making time available on the space laboratory, arranging for the translation of the data and its delivery to a recipient.[14] This would have many apparent advantages

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[10]Jaffe and Summers, supra note 4, at 40.

[11]Jaffe and Summers, supra note 4, at 40.

[12]For a detailed review of the NASA's activities in international affairs see its Semiannual Reports to Congress.

[13]See UN, Press Release WS/519, 10 September 1971, p. 6.

[14]One example of such collaboration is the scientific experiment No. S 183 being built by the French for use on an early Skylab experiment. This experiment will study stellar clouds in the Milky Way, clusters of stars, galactic evolution and structure.

for the donor state. It would be in a position to retain control over the uses to which its laboratory would be put, both with regards to the times when others could use it and the type of experiments that could be carried out. It would also permit it to be selective as regards the countries which would be allowed to participate in the program. Finally, the direct bilateral approach would make obvious to whom the recipient country should owe its gratitude.

The direct approach also has disadvantages, many of which have already been raised in the arguments over the preferability of the multilateral approach to financial aid to developing nations as opposed to the bilateral approach.[15] The bilateral approach runs the danger of being considered by the recipient nations as paternalistic, either as "neo-colonialism" or plain charity. The power to choose which countries shall be permitted to use a space laboratory's facilities could well lead to jealousy on the part of those who were excluded or were forced to accept later priority. Finally, this approach, unless carefully planned, indeed could result in an aura of cold-war politics which might make it distasteful to all concerned.

The true multilateral approach, the obvious alternative, would not be completely suitable either. On the one hand, it would have the advantage of allowing lesser developed countries to share in making all the necessary decisions involved in inventorying the earth's resources. This would provide an important input into the program in that the developing nations may well know better than the developed nations what their needs really are. Above all, it would tend to eliminate any possible intrusion of "paternalism" or cold-war politics. On the other hand, we come back to the fact that only the two super powers at present have the financial and technological resources necessary to create, launch, and man a space laboratory. Even if all the other member countries of the United Nations could pool their scientific resources for that end, unless there was some help from the U.S. or the U.S.S.R. and possibly China, it would prove to be an impossible financial burden. At the same time it does not seem reasonable to ask the U.S. or the U.S.S.R. to donate resources to an international agency which would deny them any control over how they were used. The debates over SUNFED (Special United Nations Fund for Economic Development) and UNCTAD (United Nations Conference on Trade and Development) demonstrate that there are limits to what the richer nations will go to meet the demands of the developing nations.[16]

The alternative proposed here is a modified multilateral approach consisting basically of the creation of a new international organization of the traditional mold,

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[15] For a recent discussion of this problem, see Blair, The Dimension of Poverty, 23 *International Organization* 683-704 (1969).

[16] As regards the UNCTAD controversy, see Gardner, The United Nations Conference on Trade and Development, *22 International Organization* 99-130 (1969). A discussion of the main points in the refusal of the developed countries to support the SUNFED proposal is contained in Manzer, The United Nations Special Fund, 17 *International Organization* 766-789 (1964). For a more detailed study see R. Elder, *Economic Development* Special United Nations Fund for Economic Development (SUNFED), (1954).

including preservation of the concept of equality of states, which would be empowered to negotiate with any state contemplating the launching of a space laboratory for room for experiments by its members. The United States and the U.S.S.R., then, would retain the basic decision-making power, that of how much time would be made available to other nations. Once that decision is made, within carefully limited boundaries, the member countries would be free to decide on which among them would be given priorities and what types of experiments could be conducted.

It was this priority, then, the need to recognize the legitimate rights of the states with the power to carry out a space laboratory program while at the same time recognizing the legitimate aspirations of the developing nations, which motivated the authors to draw up the draft treaty which follows. The proposed new international agency is empowered to "negotiate" for time aboard space laboratories of the United States and possibly the U.S.S.R. This recognizes that the suppliers of this service are few and that the other states do not have the necessary resources to do it by themselves. The donor state will retain the power of making the basic decisions, those decisions which only it has the information necessary to make. No mention is made of payment for services. This recognized that, if a program of the kind contemplated is to have any chance of seeing life, the super-powers must in fact donate time aboard their laboratories. A nominal fee may be required, perhaps even be desirable, but anything more would make the whole idea unworkable.

Because of the scientific nature of the work being contemplated, another priority was the need to create within the new international organization a body which could make highly technical decisions concerning the nature of the experiments to be permitted and highly political decisions concerning the scheduling of experiments by the member countries. The Technical Commission which is proposed to carry out these tasks is modeled on the International Frequency Registration Board (IFRB) of the International Telecommunication Union (ITU), which, at least in the beginning, was designed to merge extremely high technical skills and at the same time provide a basis for third-party decision making.

A third priority, one that surfaced during the research, was safety. Space travel is only a decade old; and, as the recent tragedy in the Russian program reveals, there is a great deal about it that we do not know. Consequently, any program of the type being proposed here must take into account the hazardous nature of space travel and the possibility that accounts could occur which might injure people in the countries over which the space platform is orbiting. Safety and research on safety measures thus become a dominant theme.

There was no single international organization whose basic document could be used as a prototype. It was necessary, therefore, to use a number of sources. The first and most important was the International Telecommunication Convention, the basic treaty of the

International Telecommunication Union.[17] In addition to providing a model for the Technical Commission, this document is extremely valuable since it too deals with a highly technical subject matter in detailed study. This attention to detail is, of course, due to the fact that the ITU is a very old international organization and its basic charter has thus had numerous revisions. Also used to a great extent was the Statute of the International Atomic Energy Agency (IAEA) because, of all the universal international organizations, the IAEA is one of the few which is authorized by its basic charter to engage in actual operation of technical facilities.[18] The basic document of Intelsat,[19] for the obvious reason that it also deals with space activities, and the Draft United Nations Convention on the International Seabed Area, because of its highly contemporary nature, were also used.[20]

The final result is submitted in the modest hope that it will at least provide a starting place for discussions which might lead to making the tremendous benefits of space laboratories available for bettering the conditions of all peoples of the earth.

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[17]International Telecommunication Convention, General Secretariat of the International Telecommunication Union, Geneva, 1965.

[18]Draft United Nations Convention on the International Seabed Area, Working Paper, August 3, 1970.

[19]See Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System. Done August 20, 1964. 514 *U.N.T.S.* 26-47. *See also* the interim arrangements in Special Agreement, done August 20, 1964, 514 *U.N.T.S.* 48-69.

[20]International Atomic Energy Agency, Statute of the International Atomic Energy Agency, Vienna, October 26, 1956.

THE INTERNATIONAL AGENCY FOR EARTH RESOURCE EXPERIMENTS

(IAFEREX)

PREAMBLE

The Governments signatory to this Charter, believing in the equal rights of all nations and in the essential worth of all human beings, and being aware of the need for international cooperation;

Recalling the General Assembly's Declaration (XVII) of 1962 that the exploration and use of outer space should be carried on for the betterment of mankind and for the benefit of States irrespective of the degree of their economic and scientific development;

Convinced that space laboratories can provide new and useful information about the earth's resources which will contribute to the world's prosperity, peace and understanding;

Determined, to this end, to provide the most efficient and economical service possible, consistent with the best and most equitable use of technological experiments to which all interested nations shall have access;

Believing that it is desirable and proper to establish a definitive arrangement for an organization to conduct such affairs;

Agree as follows:

Chapter I

NAME AND PURPOSES

Article 1 – Name

The states which become parties to the present Charter constitute The International Agency for Earth Resource Experiments (IAFEREX). The Agency is an intergovernmental, technoscientific, non-profit making agency.

Article 2 – Purpose

1. The purposes of the Agency are:

a) to promote the development and use of space laboratories to explore and inventory the resources of the earth;

b) to promote the development of technical facilities and their most efficient operation, with a view to improving the efficiency of space laboratories, increasing their usefulness; and making them, so far as possible, generally available to all nations;

c) to promote research on safety of life in space;

d) to harmonize the actions of nations in the attainment of these common ends.

2. To this end, the Agency shall in particular:

a) negotiate with interested governments (hereinafter referred to as the Sponsoring Party) for time aboard their space laboratories for use by the Agency;

b) coordinate the planning and designs of experiments to be carried out by space laboratories under contract to the Agency;

c) foster the creation, development and improvement of the facilities necessary for space laboratory experiments in the new and developing countries, especially by participation in the appropriate programs of the United Nations;

d) encourage cooperative efforts aimed at safeguarding human life in space;

e) undertake studies, formulate recommendations and opinions, and collect and publish information concerning relevant space laboratory matters for the benefit of all nations.

Article 3 – Basic Principles

1. All members shall have the right to benefit from the use of space laboratories contracted by the Agency to explore and inventory their natural resources.

2. Activities aboard space laboratories under contract to the Agency shall be used primarily for the identification and control of the earth's resources or for the improvement of the state of the art, technology, science, and safety of space laboratories.

3. Nothing in this Charter, however, shall be construed to prohibit other peaceful scientific experiments by contracting parties in the medical, biological, or psychological realms.

4. All experiments shall be for peaceful purposes.

5. The Agency shall make arrangements with the Sponsoring Parties to train space scientists from member countries and to utilize them in space flights whenever it is deemed feasible by the Sponsoring Party.

6. Members with an advanced space technology should make every effort to provide technical assistance to other nations in the development of useful space laboratory experiments.

Article 4 — General Provisions Relating to Experiments

1. Any member or group of members of the Agency desiring to set up an experiment to be carried out aboard a space laboratory under contract to the Agency shall submit to the Agency a clear description of the experiments desired and the areas (of land and water) over which the experiment is to be conducted. Any such request shall include sufficiently detailed information concerning the nature of the data required, their resolution, the frequency of acquisition, the method of analysis, and the form in which results should be submitted.

2. Before approving the inclusion of an experiment in a space laboratory package under this article, the Technical Commission shall give due consideration to:

   a) the usefulness of the project, including its scientific and technical feasibility;

   b) the availability of plans, funds, and technical personnel to assure the effective execution of the project;

   c) the adequacy of proposed safety standards;

   d) the special needs of the under-developed areas of the world; and

   e) such other matters as may be relevant.

4. Information obtained in a space laboratory experiment shall be submitted by the Sponsoring Party to the customer through the Agency in the form, quantity, and technical level specified by the customer and on the date specified by the customer.

5. No party shall have the right to obtain and use the results of another party's experiments without the other party's consent. Such international patent laws as exist or might come into existence shall be applicable to the protection of such data.

6. Nothing in this Charter shall be interpreted to mean that two or more states shall not be permitted to share in the design and construction of experiment packages and to share the resulting data.

Article 5 – Expenses Involved in Experiments

1. Expenses involved in the design and construction of experiments shall be borne by the country or countries requesting them.

2. Expenses incurred in the use of space laboratories shall be borne by the party or parties requesting the experiment according to a scale of charges established by the Council for each space laboratory package sponsored by the Agency. The proceeds of such charges shall be placed in a separate fund which shall be used to help defray the expenses incurred by the Sponsoring Party.

3. Upon request, the Agency may assist any member or group of members to make arrangements to secure necessary financing from outside sources to carry out their projects. In extending this assistance, the Agency will not be required to provide any guarantees or to assume any financial responsibility for the experiment.

Article 6 – Discipline and Safety

1. a) Experiments carried out by Members shall not be harmful to the scientists, technicians, and astronauts involved in the planning, construction, or navigation of space laboratories.

   b) Experiments carried out by Members on space laboratories shall not be harmful to the inhabitants of the earth over which the space laboratory is orbiting.

2. a) All astronauts or other personnel aboard an orbiting space laboratory are under the direct control of the captain of the space crew as regards to all matters concerning the operation and safety of the space laboratory and space launch vehicles and the re-entry vehicle.

   b) All offenses committed aboard the space launch vehicle, the re-entry vehicle, and the space laboratory which might harm the operation of the experiments or put the crew in danger at any time, shall be punishable in accordance with the administration or judicial procedures of the Contracting State or the state of which the perpetrator of the offense is a national.

3. Each Member shall be responsible for any damages caused by its nationals to the space launch vehicle, the re-entry vehicle, and the space laboratory.

4. Each Member is responsible for any damages caused by its experiments to the space launch vehicle, re-entry vehicle and space laboratory or to people or property on the earth over which the space laboratory is operating.

5. In case of emergency, all Members shall do everything within their power to assist the Sponsoring Party, or Agency, or both to bring the inhabitants of the space laboratory, space launch vehicle, or the re-entry vehicle back safely to earth. The provisions of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched Into Outer Space of April 22, 1968, shall be binding in emergency situations for all Members and Associate Members which have ratified or acceded to that Agreement at the time of the emergency.

6. At least one spare space launch vehicle with trained crew shall be available at all times for emergency missions when experiments are being undertaken under the auspices of the Agency.

Chapter II

COMPOSITION OF THE AGENCY

Article 7 – Membership

1. The International Agency for the Earth Resource Experiments is comprised of Members, Associate Members, and Observers.

2. A Member of the Agency shall be:

   a) any state, which is a member of the United Nations or of any of the Specialized Agencies which has signed and ratified this Charter;

   b) any other country which applies for membership in the Agency and which, after having secured approval of such application by two-thirds of the Members of the Agency, accedes to this Charter.

3. An Associate Member of the Agency is:

   a) any sovereign country which has not become a Member of the Agency in accordance with Article 7, paragraph 2, by acceding to this Charter, after its application for Associate Membership has been approved by a majority of the Members of the Agency;

b) any dependent territory on behalf of which a Member of the Agency has acceded to this Charter and the application of which has been sponsored by the General Assembly of the United Nations.

4. An Observer of the Agency is any university, scientific or technical institution, whose participation in the work of the Agency would contribute substantially to its aims and purposes and whose application for membership receives a majority of the votes of the Members of the Agency.

5. For the purposes of 2 b), 3 a) and b), and 4, if an application of membership is made through the appropriate diplomatic channel and to the intermediary of the country of the seat of the Agency during the interval between meetings of the Assembly, the Secretary-General shall consult the Members of the Agency; a Member shall be deemed to have abstained from voting if it has not replied within four months after its opinion has been requested.

Article 8 – Rights and Obligations of Membership

1. a) All Members shall be entitled to participate in conferences of the Agency and shall be eligible for election to any of its organs.

b) Each Member shall have one vote in all conferences of the Agency and at meetings of the Commission and Council if it is a member thereof.

c) Each Member shall have one vote in all consultations carried out by correspondence.

d) Each Member shall have the right to send five official delegates to meetings of the Assembly.

2. Associate Members shall have the same rights and obligations as Members of the Agency, except that they shall not have the right to vote in any conference or meeting nor the right to nominate candidates for membership on the Council and Commission.

3. Observers of the Agency may send an official observer to all meetings of the Assembly and to any meeting of the Council or the Commission to which they have been invited by a majority of the members.

Article 9 Termination of Membership

1. Members, Associate Members, and Observers of the Agency may file an intent-to-terminate notification addressed to the Secretary-General by diplomatic channel through the intermediary of the government of the country where the seat of the Agency is located. The Secretary General shall advise the other Members and Associate Members thereof.

2. Termination of membership shall go into effect twelve months after an intent-to-withdraw notification has been acknowledged by the Secretary General, for all Associate Members and Observers.

3. Termination of membership for Members of the Agency shall, in principle, go into effect twelve months after an intent-to-withdraw notification has been acknowledged by the Secretary General, unless at the proposed date of withdrawal a space laboratory launched under contract to the Agency is in operation. If such is the case, termination of membership shall be postponed until the end of the operation in question.

Chapter III

STRUCTURE OF THE AGENCY

Article 10 – Seat of the Agency

The permanent seat of the Agency shall be at _____

Article 11 – Principal Organs

The principal organs of the Agency shall be the Assembly, the Council, the Technical Commission, and the General Secretariat.

Article 12 – The Assembly

1. The Assembly, the supreme governing body of the Agency, shall be composed of delegations representing Members and Associate Members.

2. The Assembly shall do the following:

   a) determine the general policies necessary to fulfill the basic principles of the Agency as set forth in Article 3 of this Charter;

b) approve states for membership in accordance with Article 7;

c) elect the Members of the Agency which are to serve on the Council;

d) elect the individuals who are to serve on the Technical Commission;

e) consider the Council's annual report on its activities and those of the Agency;

f) establish the budget of the Agency;

g) give final approval to contracts for space laboratories;

h) give final approval to the accounts of the Agency;

i) elect the Secretary-General and fix the date of his taking office;

j) give final approval to agreements between the Agency and other international organizations;

k) adopt its own rules of procedure;

l) deal with such other questions concerning the Agency as may be necessary.

3. The Assembly shall normally meet once a year at the seat of the Agency. An extraordinary meeting of the Assembly may be called when requested by at least one-quarter of the Members of the Agency or by a proposal of the Council.

4. a) A quorum of the Assembly shall consist of a majority of the Agency's voting members.

b) Unless otherwise specified in this Charter, a majority vote shall be required to pass any action of the Assembly.

Article 13 – The Council

1. The Council shall be composed of eighteen Members of the Agency elected by the Assembly in the following fashion:

a) six shall represent Members of the Agency who are the most advanced in the aerospace field;

b) six shall be from among the lesser developed member countries;

c) six shall be from the membership at large with due regard to the need for equitable representation of all parts of the world.

2. a) The Council shall meet as often as is necessary, normally at the seat of the Agency.

   b) The Council may be convened in emergency session by its Chairman or at the request of any six of its members.

3. a) Each Member of the Council shall have one vote.

   b) Decisions of the Council shall require approval of a majority of its Members.

4. The Council shall adopt its own Rules of Procedure.

5. The Council shall elect its Chairman and Vice Chairman at the beginning of each annual session. They shall serve until the opening of the next annual session and shall be eligible for re-election.

6. The Secretary-General, the Chairman and the Vice Chairman of the Commission may participate in the deliberations of the Council, but without the right to vote. Nevertheless, the Council may hold meetings restricted to its own members.

7. The Secretary-General shall act as Secretary to the Council.

8. Only the travelling and subsistence expenses incurred by the representative of each Member of the Council while serving in his capacity as a member of the Council shall be borne by the Agency.

9. The duties of the Council shall be:

   a) to perform any duties assigned to it by the Assembly;

   b) to negotiate agreements with interested governments for time aboard space laboratories for use by the Agency, which shall be submitted to the next Assembly for final approval;

   c) to draw up a schedule of mutually acceptable charges for the installation of experiments aboard space laboratories for each mission in consultation with the Sponsoring Party;

   d) to negotiate cooperative agreements with other international organizations which shall be submitted to the next Assembly for final approval;

   e) to supervise the administrative functions of the Agency;

   f) to arrange for the annual audit of the accounts of the Agency for submission to the Assembly;

g) to coordinate the activities of the permanent organs of the Agency and review their annual reports;

h) to submit an annual report on its activities and those of the Agency for consideration by the Assembly;

i) to nominate candidates for the office of Secretary-General of the Assembly for its approval;

j) to arrange for the convening of Extraordinary Assemblies in accordance with Article 13;

k) to provide a provisional agenda for meetings of the Assembly;

l) to offer recommendations to the Assembly;

m) to promote international cooperation for the purpose of providing technical assistance to the new and developing countries through every means at its disposal, especially through participation of the Agency in the appropriate programs of the United Nations;

n) to take the necessary steps, with the agreement of a majority of the members of the Agency, to provisionally resolve questions not covered in the Charter and which cannot await the next Assembly for settlement;

o) to perform all other functions prescribed for it in this Charter and, within the framework of the Charter, any functions deemed necessary for the proper administration of the Agency.

Article 14 – The Technical Commission

1. a) The Technical Commission shall consist of five independent members;

b) the members of the Commission shall be thoroughly qualified by technical training in aerospace engineering and, if possible, should possess practical experience in the field.

2. The selection of the members of the Commission shall be as follows:

a) Every five years the Assembly shall elect five individuals who have been sponsored by a Member of the Agency for membership on the Commission;

b) each Member of the Agency may propose one candidate;

c) each candidate must possess the minimum qualifications described in Article 14 (l.b).

d) members are eligible for re-election;

e) the exact election procedure shall be established by the Assembly.

3. The Commission shall select from among its members a Chairman and a Vice-chairman who shall serve for one year. Thereafter, the Vice-chairman shall succeed the Chairman each year and a new Vice-chairman shall be elected.

4. The Commission shall be assisted by a specialized secretariat.

5. a) The members of the Commission shall serve, not as representatives of their respective countries, but as custodians of an international public trust.

b) No member of the Commission shall request or receive instructions pertaining to the exercise of his duties from any government or official thereof. Furthermore, each Member and Associate Member must respect the international character of the Commission and of the duties of its members and shall refrain from any attempt to influence any of them in the exercise of their duties.

6. The Duties of the Technical Commission shall be:

a) to coordinate and integrate the various experiments requested by the Member states to be carried out in space laboratories under contract to the Agency;

b) to establish a priority for conducting experiments based on the importance of the experiment with respect to the development of national resources and the level of development of the country requesting the experiment;

c) to process the data obtained from experiments and make it available in a useable form to the country or countries which have requested the experiment;

d) to investigate possibilities for extending the scope of the work to be carried out by space laboratories;

e) to study various operational and technical questions relating to the use of space laboratories for earth resource experiments;

f) to study and offer advice to Members and Associate Members as regards to the utilization of space laboratories in determining earth resources;

g) to study and offer advice to Members and Associate Members concerning safety of life in space, including the international standardization of docking adaptors;

h) to offer recommendations to the Assembly;

i) to coordinate activities of Members and Associate Members and Sponsoring Parties in the training of scientists and technicians, other than nationals of the contracting party, for service on space laboratories;

j) to carry out any other scientific activity requested by the Assembly;

Article 15 – The Secretariat

1. The Secretariat shall be composed of a Secretary-General and such staff as the Agency may require.

2. The Secretary-General shall be appointed by the Assembly, acting on the council's nomination, for a term of six years and is eligible for reappointment.

3. The paramount consideration in the recruitment and employment of staff shall be to secure individuals who meet the highest standards of efficiency, technical competence, and integrity. Subject to this consideration, due regard shall be given to the importance of recruiting the staff on as wide a geographical basis as possible.

4. The terms and conditions on which the staff shall be appointed, remunerated, and dismissed shall be in accordance with regulations established by the Council in consultation with the Secretary-General.

5. In performing their duties the Secretary-General and the Staff shall neither seek nor receive instruction from any government or any other external authority; and, subject to their responsibilities to the Agency, shall not disclose any confidential information coming to their knowledge while serving in their official capacity.

6. Each Member and Associate Member undertakes to respect the exclusively international character of the duties and responsibilities of the Secretary-General and the staff and shall not seek to influence them in the discharge of their duties.

7. The Secretary-General shall be responsible to the Council for all the administrative and financial aspects of the Union's activities.

8. In particular, the Secretary-General shall:

a) act as secretary to all meetings of the Council and Assembly;

b) organize the work of the Secretariat and appoint the staff in accordance with the directives of the Assembly and Council;

c) Make arrangements for providing a specialized secretariat for the Technical Commission and appointing its staff in agreement with its Chairman. The appointments shall be made with regard to the Chairman's choice, but the final decision for appointment or dismissal shall rest with the Secretary-General;

d) undertake secretarial work preparatory to, and following conferences and meetings of the Agency;

e) provide, where appropriate in cooperation with the inviting government, the secretariat of conferences and meetings held under the auspices of the Agency;

f) publish the recommendations and principal reports of the permanent organs of the Agency;

g) assemble and publish both technical and administrative information which might be specially useful to new and developing countries in order to help them make the best use of the services of the Agency;

h) collect and publish information that would be of assistance to Members and Associate Members regarding the development of technical methods for use on space laboratories in the collection of data on the earth's resources;

i) collect and publish information dealing with safety of life in space;

j) publish periodically a journal of general information and documentation which will bring about better understanding of the nature of IAFEREX and its functions;

k) prepare and submit to the Council annual budget estimates for its approval;

l) prepare an annual financial operating report to be submitted to the Council;

m) prepare an annual report on the activities of the Agency to be submitted to the Council;

n) perform all other secretarial functions of the Agency;

o) act as the legal representative of the Agency.

Article 16 – Finances

The ordinary expenses of the Agency shall be borne by the Members and the Associate Members as apportioned by the Assembly, due regard being given to each country's state of development.

Article 17 – Languages

1. a) The official languages of the Agency shall be Chinese, English, French, Spanish, and Russian.

   b) The working languages of the Agency shall be English, French and Russian.

   c) In case of dispute the French text shall be recognized as authentic.

2. a) The final documents of the Assembly, including resolutions, recommendations, and opinions, shall be drawn up in the official languages of the Agency.

   b) All other documents for general distribution prepared by the Secretary-General in the course of his duties shall be drawn up in the three working languages. Any of these documents may be published in any of the other official languages provided that the Members or Associate Members requesting such publication agree to assume the whole cost of translation and publication.

3. a) At conferences and meetings under the auspices of the Agency, and whenever necessary at meetings of the Council, debates shall be conducted with the aid of an efficient system of reciprocal interpretation between the three working languages.

   b) When all the participants agree, the debates may be conducted in fewer than the three working languages.

   c) The other official languages may be used in conferences and meetings under the auspices of the Agency when application therefor is made one month in advance, provided that the additional cost so incurred shall be borne by those Members and Associate Members making or supporting the application.

Article 18 – Privileges and Immunities

1. The Agency shall enjoy such privileges and immunities in the territories of its Members and Associate Members as are necessary to carry out its functions.

2. Delegates of Members and Associate Members along with their alternates and advisors, individual members of the Technical Commission, and the Secretary-General and the staff of the Agency shall enjoy such privileges and immunities as are necessary to the independent exercise of their functions in connection with the Agency.

Chapter IV

FINAL PROVISIONS

Article 19 – Amendments

1. Amendments to this Chapter may be proposed by any Member. Copies of the text of any proposed amendment shall be in the hands of the Secretary-General at least ninety days in advance of its consideration by the Assembly.

2. Amendments shall come into force for all Members when:

   a) approved by a two-thirds vote of the Assembly following consideration of observations submitted by the Council on the proposed amendment and,

   b) accepted by two-thirds of all Members in accordance with their respective constitutional processes. Acceptance shall be effected by the deposit of an instrument of acceptance with the government of the seat of the Agency.

3. At the fifth annual session of the Assembly following the coming into force of this Charter, the question of a general review of the provisions of this Charter shall be placed on the agenda of that session. On approval by a majority of the Members present and voting, the review will take place at the following Assembly.

Article 20 – Settlement of Disputes

1. Members and Associate Members shall settle any dispute arising over the interpretation or application of the provisions of this Charter through diplomatic channels, or according to procedures established by bilateral or multilateral treaties concluded between them for the settlement of international disputes, or by any other method mutually agreed upon.

2. If none of these methods of settlement is adopted, the dispute shall be referred to the International Court of Justice.

Article 21 – Signature, Acceptance and Entry Into Force

1. This Charter shall be open to signature on _____ for all states that are members of the United Nations or of any of the Specialized Agencies and shall remain open for signature for a period of ninety days.

2. The signatory states shall become parties to this Charter by deposit of an instrument of ratification with the government of the country where the seat of the Agency is located.

3. Ratification or Acceptance of this Charter shall be effected by states in accordance with their respective constitutional processes.

4. This Charter shall come into force when eighteen states have deposited instruments of ratification in accordance with paragraph 2 of this Article, provided that these eighteen states shall include among their number at least three of the following states: France, the Union of Soviet Socialist Republics, China, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

Article 22 – Registration with the United Nations

This Charter shall be registered by the depository Government pursuant to Article 102 of the Charter of the United Nations.

Article 23 – Authentic Texts and Certified Copies

1. This Charter, done in Chinese, English, French, Russian, and Spanish languages, shall be deposited in the archives of the depository government.

2. In case of dispute the French text shall be authentic.

3. Duly certified copies of this Charter shall be transmitted by the depository government to each of the signatory states.

In witness whereof the undersigned, being duly authorized, have signed this Charter. Done at _____
this _____ day of _____

Annex I: Definitions

The following definitions shall apply to this Charter:

"Agency" refers to IAFEREX

"Atmosphere" refers to the space above the earth's surface up to an altitude of 50 miles.

"Charter" refers to the written text of all provisions of this document and its amendments.

"Contracting Party" refers to each signature of this Charter.

"Docking adaptor" refers to the device that permits the uniting of two independent segments of a spacecraft.

"Customer Party" refers to any party purchasing an experiment or the Agency's services.

"Experiment" refers to any set of activities, having as their agent either man, machine or both, which might be conducted aboard the space laboratory and which might provide meaningful medical, scientific, or technological data.

"Orbit" refers to the path taken by a space laboratory regardless of its geometrical shape or orientation.

"Ordinary Expenses" refers to the expenses involved in the day-to-day administration of the Agency. The expenses involved in experiments and the operation of space laboratories are not included in Ordinary Expenses.

"Skylab" refers to the first space laboratory to be launched by the United States in 1973.

"Space" refers to the volume above the earth's surface.

"Space Laboratories" refers to man-made satellites orbiting the earth or any other planet and being capable of conducting scientific experiments by man or by machine.

"Sponsoring Party" refers to any country willing to undertake the building of space laboratories, launch vehicles, or other major hardware pertinent to the interest of this Charter.

THE SPACE SHUTTLE: INVESTIGATION OF EARTH RESOURCES BY MANNED OBSERVATIONS

*John R. Tamm**

Investigation of earth resources from outer space provides for man a unique opportunity to view from a distance the composition and content of the planet upon which he resides.

Presently, unmanned orbiting satellites are gathering important information about earth resources and relying this information back to earth stations. When man establishes laboratories[1] in earth orbit, the potential of significant benefits from such investigations will materially increase.

After completion of the Skylab series, it is anticipated that a unique craft, capable of flight into and from earth orbit, will provide continuous transport of men and supplies into earth orbit. This vehicle is referred to as "The Space Shuttle". It is configured as an aircraft type orbiter, mated to a launch booster. Present design for the orbiter provides for a delta-winged craft about the size of a DC-9,[2] capable of 100-150 flights in space.[3] The solid fueled booster will be jettisoned over water and recovered for reuse; and the orbiter, after completing its mission, would return through earth's atmosphere by aerodynamic flight and conventional landing. The United States has apparently committed itself to the construction of this dual functioning system.

Success of the shuttle will provide less costly and more frequent orbiting space stations. Based upon existing designs, the orbiter may carry as many as twelve persons on a flight.[4]

Since the normal crew complement would be four, space is available for up to eight scientific investigators. One of the shuttle's greatest assets is that passengers need not be especially trained for space flight;[5] therefore, the scope of earth resources investigations may be far more extensive than contemplated in early missions. Barring unforseen restrictions in programming, an operational craft may be flyable toward the close of this decade.

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1Project Skylab is scheduled for 1973 utilizing rotational three men crews to be stationed in orbit for one to two months. For comprehensive discussion of the mission objectives, see *National Aeronautics and Space Administration, Sky-lab Program Description* (1971).

2120 feet long, wing span 75 feet,with a pay load of 65,000 pounds out to 100 mile earth orbit.

3*Aviation Week,* March 20, 1972, at 14, 15.

4Id. at 15.

5*Air Force Magazine,* March 1972, at 21, 24. See also Ulsamer, The Shuttle: U.S.'s Airline Into Space, *Air Force Magazine,* September 1971, at 53. See also *National Aeronautics and Space Administration, 1 Earth Orbital Research and Applications Investigations* 3-1, 3-11 (1971).

Although inauguration of space shuttle operations will provide routine transfer of personnel from earth's surface to orbiting stations and facilities, manned outer space investigation will have already begun under project "Skylab". Some earth resources applications are included in the Skylab program;[6] however, present planning emphasizes celestial investigations, bio-medical research and zero-gravity experiments. A vehicle such as the shuttle will possess the capability of rendezvous not only with manned stations, but also with unmanned observatories. Conceivably, service, repair and satellite placement missions as well as retrieval of satellites and data would augment manned transportation.

The Shuttle, as presently conceived, is to be the workhorse of near earth operations. It will transport passengers, supplies and space station modules through the atmosphere into orbit, and later return them to earth within its cargo compartment.

The shuttle system's will be launching ballistically similar to the Titan III method. It will enter and function in orbit much the same as other manned systems; however, its ability to maneuver in orbit, to carry large payloads, to re-enter the atmosphere and to fly aero-dynamically, distinguish it from all prior outer space vehicles.[7] Since flight after re-entry is a significant departure from present procedures, does the orbiter remain a space object or does it become an aircraft subject to all the rules and regulations of flight in antional or international airspace? Is it, therefore, a legal chameleon that assimilates with the environment in which it functions? If so, what then is the responsibility of the launching state for damage resulting to foreign aircraft while the shuttle orbiter is in aero-dynamic flight?[8]

In brief, the shuttle will offer a new dimension to man's occupation of the near-space environment and will provide expanded observation of conditions existing on earth, in earth orbit and in the solar system. The orbiter itself may be a useful short term platform for manned investigation of earth resources;[9] and it will also provide access to manned and unmanned orbiting stations so that sustained research of earth's environment may be conducted.[10] Without the means of frequent and relatively low cost transport of personnel, equipment and supplies, man's existence in earth orbit is severely limited.

The knowledge gained and the service provided from earth orbit activities should provide an effective cost-result ratio acceptable to the nation's economy. The direct benefit derived from locating fresh water resources, mineral deposits, and sea food

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[6]Sky-Lab Program Description, supra note 1, at 45.

[7]The orbiter is expected to be able to deviate up to 1000 miles from a straight in flight path. Ulsamer, *Air Force Magazine*, March 1972, at 24.

[8]See Article II, of the Draft Convention on International Liability for Damage caused by Space Objects, 8 *U. N. Monthly Chronicle*, July 1971, at 19-25. This provision appears to make liability absolute for damage caused by a space object to aircraft in flight.

[9]See *Earth Orbital Research*, supra note 5, at 3-11.

[10]Id. at 3-12.

sources, as well as effective weather reporting and pollution control, will more than offset the extensive costs. True, unmanned satellites can do the reporting for less initial expenditures, but man's ability to interpret, service, repair and replace the equipment as required should result in long term cost reductions.[11]

Due to the unusual versatility of the Space Shuttle orbiter, several interesting legal questions arise. For example:

1. If the space shuttle assumes the posture of an aircraft, does it not legally become an aircraft for that portion of flight that is aero-dynamic?

2. May the shuttle orbiter be utilized to intentionally disable or destroy an objectionable unmanned earth resource satellite owned and operated by another state?

3. May the orbiter remove from orbit, without consent, derelict earth resources satellites owned by another state?

4. May personnel of the shuttle orbiter make unannounced inspections of manned observatories under the control of another state?

5. Will manned investigations of earth resources be deemed clandestine observations if they include information of strategic significance? (Photographs of military installations, mapping, etc.)

6. What measure of liability is applicable if accidental damage occurs to an earth resource satellite as the result of shuttle orbiter operation?

7. What measure of liability is applicable if the shuttle accidentally collides with an aircraft during the orbiter's aero-dynamic flight?

8. Should the space shuttle system be international or internationally controlled?

9. What rules of operation should govern a vehicle that is equally maneuverable in outer space and in airspace?

All the questions contemplated may not be answerable under the present state of development of outer space rules and may have to await the adoption of enlightened and more extensive international agreements before they are resolved.[12] One may, however,

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[11]For a discussion of the role of man in earth observations from outer space, see *National Aeronautics and Space Administration, 4 Earth Orbital Research and Applications*, 1-65, 1-68 (1971).

[12]Reference is made here to the consideration of an independent agency to oversee outer space affairs. See Tamm, Should an International Outer Space Agency be Established? *Proceedings of the XIII Colloquium on the Law of Outer Space 53* (1971).

ponder these questions and speculate upon appropriate solutions in the light of existing treaties and principles.

THE SHUTTLE AS A SPACE OBJECT

The shuttle vehicle, as presently conceived, is to be launched from facilities located on land, with a flight path over open water. The configuration will consist of a flight orbiter boosted into space by a solid fueled booster which is to be jettisoned over international waters and retrieved. In this context, the vehicle would conform to the definition of "space object" as set forth in Article I(d) of the proposed Liability Convention.[13] As the shuttle progresses into earth orbit, its character as a space object remains unchanged, and throughout its flight in orbit, it will retain this character regardless of the purpose of its mission or the activities in which it engages. Not until it makes its re-entry into the earth's atmosphere would there be any question as to its legal definition.

Disabling A Non-Owned Space Object

The shuttle, because of its versatility in orbit, is capable of rendezvous with other space objects be they owned by the state of registry or by any other state. Therefore, it is possible that the shuttle, by reason of its powers of investigation in orbital flight, could conceivably cause unintentional or intentional damage, or cause interference to another space object not of the state of registry of the shuttle orbiter. In this event, the provisions of Article IX and Article VII of the Outer Space Treaty[14] would govern the responsibility owed by the state of the shuttle's registry to the state of registry of the space object; and depending upon the degree of negligence, if any, or deliberate action of the shuttle crew, liability for any damage caused may be charged against the state of registry of the shuttle under Article III of the Draft Liability Treaty.[15]

Removing From Orbit Non-Owned Space Objects

Since the shuttle has a transport compartment capable of storing large cargoes, it is possible that a state may undertake to remove a space object, carried upon the registry of another state, from orbit and return the same to the surface of the earth. Although it would not be contemplated that such would occur without the consent of the state of

[13]Draft Convention on International Liability for Damage Caused by Space Objects, supra note 8, at 20.

[14]Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies. U.N. Doc. A/Res/222 (XXI), December 19, 1966, T.I.A.S. No. 6347.

[15]Supra note 8, at 20.

registry, there may be occasion to remove a non-owned object from orbit if the same is causing undue or unreasonable interference or if the same may be a hazard to persons and property of the state of registry of the shuttle. It would be anticipated that any such action would be carried out only after having provided the state of registry of the space object with notice under Article IX of the Outer Space Treaty,[16] and after consultation has been had or denied as contemplated in the Article.

There could be situations in which the nature of the potential danger is so great that the removal is considered an act of self-defense. For example, this would be true if the same object carried a nuclear weapon or weapon of mass destruction in violation of Article IV of the Treaty.[17]

Strategic Observations

The shuttle craft, as contemplated, is capable of being used as an observation platform for investigation of earth resources which include mapping, photographing and similar types of investigation. In conducting this activity, it is also quite possible that the personnel of the shuttle may engage in other observations of a strategic nature that could affect military security of the state being observed. Should the shuttle be used for such observations, the question may arise as to whether or not under the principle set forth in Article III the Treaty is being violated.[18] Since many military satellites are now in orbit, and are conducting reconnaisance activities, it is doubtful that any serious objection would be raised to this type of outer space investigation, so long as it is conducted in the interest of self-defense, and so long as it does not create a threat against the peace and political integrity of the state being observed.[19]

International Control

The question of international control relates not only to the shuttle craft, but also to any objects orbiting earth, either in near earth or in stationary orbit. At this time, activities in earth orbit outer space are governed in principle by the Outer Space Treaty

16"A State Party to the Treaty which has reason to believe that an activity would cause potentially harmful interference with activities in the peaceful exploration and use of outer space may request consultation concerning the activity or experiment."

17"States parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction or station such weapons in outer space in any other manner."

18"States Parties to the Treaty shall carry on activities in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding."

19For a comprehensive discussion of reconnaisance activities in outer space see *Morenoff, World Peace Through Space Law* (1967), and Soraghan, Reconnaissance Satellites: Legal Characterization and Possible Utilization for Peace Keeping, 67 *McGill L. J.* 458-493 (1967).

and the Astronaut Rescue Treaty.[20] If the draft convention on liability is ratified by the requisite number of states, this treaty will also apply to earth orbit activities. As yet, however, there is no centralized control nor is there a single document which would govern the action of states in the conduct of activities in outer space on the order of the International Civil Aviation Organization, as created by the Chicago Convention. It is the thesis of this author that in due time an outer space agency will be established to provide for a coordination of effort and activity in outer space within a single international organization. It would be given the function of establishing coordination between existing agencies, adoption of rules and regulations relating to outer space flight, and providing for a procedure for settlement of claims and disputes within a juridicial organ adjunctive to the main agency.[21]

For the time being, however, international control of the shuttle vehicle is not anticipated. Since the activities of the shuttle will not take place until the latter part of this decade, some progress may have been made toward the establishment of an international agency.

As proposed by this writer, the organizational structure contemplated is set forth in a chart which diagrams the procedural aspects of the functional responsibility of the agency.[22] It should be noted that included in the structure are provisions for establishing space rescue and space contamination sections. The shuttle system would be particularly adaptable to these functions and it may well be that an international agency would own or have control of one or more shuttle vehicles to perform one or more purposes within its area of responsibility; for example, rescue or investigation of the peaceful pursuit of manned and unmanned orbiting satellites and laboratories. Observation by an international inspection team may eliminate the need for unannounced visitations by personnel of other states.[23]

THE SHUTTLE AS AN AIRCRAFT

When the shuttle has performed its mission and purpose in near earth orbit, it must begin its descent and enter the atmosphere for landing at a designated site. During this phase of the flight, the shuttle will be capable of a degree of aero-dynamic flight and may maneuver in the airspace for some period of time. In this configuration, it is questionable as to what type of vehicle the orbiter actually is. For all practical purposes, it will function as an aircraft in the airspace, and logically, it should be subject to the national

[20]Agreement on Rescue of Astronauts, The Return of Astronauts, and the Return of Objects Launched into Outer Space, U.N. Doc., A/Res/2345 (XXII), January 16, 1968.

[21]See Tamm, supra note 12.

[22]Ibid.

[23]Articles X and XII of the Outer Space Treaty provide for visitation after consultation and upon the basis of reciprocity; however, it is not clear if these provisions include space objects and stations in earth orbit.

laws and regulations of the territory in which it is engaged in flight; and if in international territory, then it is reasonable to assume that it would be subject to the recommended rules and practices of the International Civil Aviation Organization.

For purposes of responsibility, it may be argued that existing rules of liability as presently applied to aircraft would also be applicable to the orbiter in this stage of its flight program. Applying the principle of dual definition, one would question the applicability of the Draft Convention on International Liability for Damage as set forth in Article II, if, in fact, there was damage resulting to the surface of the earth or to other aircraft in flight. The problem would not arise if the injury occurred over the territory of the state of registry and the state of launch, but should the incident occur in international airspace or over the territory of a third state, then, in that event, the issue of definition of "space object" or "aircraft" would be quite material. It would seem to this writer, that if, in fact, the orbiter is fully capable of sustained flight by aero-dynamic lift, and it is functioning in that configuration at the time the collision occurs or damage on the surface of the earth results, that the rules relating to aircraft operation would pertain, rather than the rules of the draft convention.

National Control

Taking into account that the orbiter when functioning in the airspace is also an aircraft as well as a space object, the national rules relating to flight in the airspace would be fully applicable to the orbiter's flight. Most landings would occur in the state of registry of the shuttle and, therefore, any necessary modification to national rules to conform to the orbiter's flight characteristics could be easily amended. However, should the orbiter engage in flight in the airspace of the territory of a state not of registry, then it would appear that all rules and regulations relating to flight in the airspace would appertain to the orbiter vehicle to the same extent that said rules and regulations would appertain to other aircraft operating in that state's airspace. In view of the fact that the shuttle orbiter initially may be defined as a state aircraft as opposed to commercial aircraft as set forth under the Chicago Convention,[24] certain special procedures would have to be implemented in order to properly authorize flight in the airspace of the non-registry state. It would be assumed that such authorization had been previously coordinated, except in the event of emergency, in which case the provisions of the Astronaut Rescue Agreement would apply even though the orbiter by definition would be an aircraft.

CONCLUSIONS

From the brief considerations set forth above, one can see that the extent of activities in near earth orbit will increase and the scope of operation will materially

[24]Article 3, Convention on International Civil Aviation, 61 Stat. 1180.

change from present activities. The shuttle orbiter will provide the capability for observation of activities relating to scientific investigation of the earth, and it will provide the means of transport of personnel to scientific laboratories engaged in earth resources investigations in near outer space orbit. It will also provide a means to remove from orbit spent space objects which no longer serve a useful purpose or which may be contaminating or interfering with the activities of other objects in orbit. Additionally, the shuttle is a means to provide service and repair to unmanned observational satellites, as well as to make investigations of activities of objectionable objects and to provide rescue for personnel stranded in earth orbit.

In short, the development of outer space activity is rapidly approaching the productive stage. Such development is leading to a time when manned platforms will produce the tangible benefits that will result from the expenditures previously made in the investigation of the near earth space. The space shuttle as an observation platform and as a transport vehicle provides the bridge to expansion of the investigations of earth resources.

SHOULD THE UNITED NATIONS DRAFT A TREATY ON EARTH RESOURCES SATELLITES?

A Pro and Con Analysis

*Eilene Galloway**

I. Introduction

On March 29, 1972, ceremonies were held simultaneously in Washington, London, and Moscow for the signing of the *Convention on International Liability for Damage Caused by the Launching of Objects into Outer Space.* After representatives of the United States, the United Kingdom and the Soviet Union affixed their signatures to this document in Washington, 37 nations joined in signing this new international agreement. This is the third outer space treaty drafted by the United Nations Committee on the Peaceful Uses of Outer Space, working largely through its Legal Subcommittee.

The first space treaty, ratified on October 10, 1967, is known as the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies.* By ratifying or acceding to this document, 64 States have now bound themselves to observe guidelines in the development of space activities for peaceful purposes for the benefit of all mankind. It was recognized, however, that some of the general principles would require more detailed implementation in order to provide a basis for solving problems created by advances in space science and technology.

The second space treaty, therefore, represented an elaboration of the general principles set forth in the Outer Space Treaty on the treatment of astronauts and space objects. Starting from the Treaty's Articles V, VIII and XIII, the United Nations drafted the *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,* which was ratified on December 3, 1968. There are now 56 States which are parties to this treaty.

Similarly, Articles VI, VII, and VIII of the Outer Space Treaty provided a foundation upon which to build the detailed provisions of the Convention on Liability for Damage which has been recommended for ratification to States by the United Nations General Assembly.

A number of other space problems have occupied the Committee on the Peaceful Uses of Outer Space during recent years. The agenda has included such subjects as the

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registration of space vehicles, the definition of outer space, navigation satellites, treaty proposals concerning the moon, and direct broadcast satellites. Among the emerging problems, however, none has excited more attention than the implications for the future of earth resources satellites.

II. Earth Resources Satellites

At a time when people throughout the world have become increasingly conscious of the necessity for protecting the environment, earth resources satellites offer hope as a new tool for the management of resources. These satellites are designed to collect data by remote sensing and send it electronically to earth stations which change the signals to a type of photograph to be processed at a data center. Few such centers are needed, although the amount of data to be handled is tremendous.

Rapid sequential information can be derived from large areas of the earth and when analyzed provide an improved basis for decision making. Mineral resources can be detected and river systems measured. Pollution patterns can be mapped as they appear in air, land and water. Housing and transportation can be analyzed for urban and regional planning. From the distribution of snow, estimates can be made of the rate of melting so that floods can be predicted far in advance of their rise. The blighted parts of forests and crops can be detected so that steps may be taken to prevent the spread of insects and disease. Forest fires can be spotted before they spread beyond control. Volcanoes can be monitored and the paths of storms and hurricanes sighted long before they strike populated cities. We have already seen the benefits of meteorological satellites in saving lives and property through early storm warnings. By using remote sensing, satellites add a new perspective to knowledge because they penetrate deeply into environmental phenomena and operate with such rapidity that quick reactions can be made to any changes to objects that are being measured.

NASA will soon launch the first earth resources technology satellite, the ERTS–A, with experiments from 28 states, the District of Columbia, and 22 foreign countries. The SKYLAB spacecraft will be sent into orbit in the spring of 1973, and the ERTS-B is scheduled for launching in November 1973. An operational flight could begin as early as the end of 1975.

Fortunately, there is widespread recognition that this new space technology can have many consequences—political, economic, legal, social and cultural. Numerous problems that are likely to arise have been identified, and there is awareness on the part of many nations and international organizations that institutions must prepare themselves to keep abreast of this new development.

III. The United Nations Working Group on Remote Sensing of the Earth by Satellites.

On November 29, 1971, the United Nations General Assembly adopted unanimously a resolution on "convening of the Working Group on Remote Sensing of the Earth by Sattellites" and thereby set in motion an inquiry into substantive matters involving earth surveys by satellites. The General Assembly welcomed the establishment of a working group by the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, and Pointed out that "the potential benefits from technological developments in remote sensing of the earth from space platforms could be extremely meaningful for the economic development of all countries, especially the developing countries, and for the preservation of the global environment. . ." The General Assembly was aware that experiments on the feasibility of remote sensing would begin early in 1972 and requested Member States to submit reports, comments and working papers to the Working Group. Approval was given for the Working Group to seek the views of United Nations bodies and specialized agencies, as well as other international organizations having an interest in earth resources satellites. The Secretary General was requested to give comments and working papers to the Working Group, and, finally, the General Assembly asked to be kept "informed in a comprehensive fashion on the progress of its work."[1]

The appointment as Chairman of the Working Group was made to Dr. Franco Fiorio, a member of the Italian Delegation to the United Nations' General Assembly since 1957, and Italian Delegate in the U.N. Committee on the Peaceful Uses of Outer Space since 1958.

We are now in a period when ideas are sought in order that national and international institutions and activities may be coordinated with the development of earth resources satellites both in their experimental and operational stages. The United Nations may consider a number of alternatives, among which is the possibility of drafting a treaty on remote sensing by satellites. At a time when analyses and decisions are in the process of being made, this paper is designed as a contribution to elicit discussion on the advantages and disadvantages of the treaty approach toward dealing with problems likely to arise from the use of earth resources satellites.

IV. A Treaty on Earth Resources Satellites: PRO

1. Existing and pending treaties on outer space represent great advances but do not provide adequately for problems anticipated from an operational remote sensing system. This new space technology is worldwide in scope and will also have an impact on individual nations, particularly with regard to economic, political and legal matters. It is, therefore, a subject requiring international agreement among nations with regard to its development and control.

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[1] U. N. Doc. A/RES/2778 (XXVI), December 8, 1971.

2. The United Nations Committee on the Peaceful Uses of Outer Space, working through its Legal Subcommittee and its Scientific and Technical Subcommittee, has been highly successful in relating space science and technology to national and international space activities and in formulating treaties which have gained wide acceptance. We can, therefore, have confidence that this Committee will be able to work out the problems involved in achieving a consensus on provisions appropriate for a treaty governing earth resources satellites.

3. The idea has been accepted that the Treaty on Outer Space (October 10, 1967) contains general guiding principles which can be implemented in more detailed treaties as science and technology develop and international support is organized to meet new challenges. This is the formula used in negotiating two additional space treaties: the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (December 3, 1968); and the Convention on International Liability for Damage Caused by the Launching of Objects into Outer Space (signed on March 29, 1972). The same formula can be used in the case of earth resources satellites.

4. Some of the Outer Space Treaty's guiding principles which can serve as a point of departure in working out the details of problems involved in remote sensing are: (1) that the use of outer space shall benefit all countries "irrespective of their degree of economic or scientific development, and shall be the province of all mankind"; (2) that space activities shall be carried on in accordance with international law and the UN Charter; (3) that adverse changes in the Earth's environment shall be avoided; (4) that the UN Secretary General shall be informed of all space activities and disseminate the information immediately and effectively; (5) that equality shall serve as a basis for considering requests to observe the flight of space objects, the conditions to be determined by agreement between the States concerned; and (6) that practical questions carried on by international inter-governmental organizations shall be resolved under principles specified in the Treaty.

5. The Convention on International Liability for Damage Caused by the Launching of Objects into Outer Space also contains provisions which are applicable to situations which may arise in connection with remote sensing insofar as they fall within the definition of "damage" in this treaty. If supplementary provisions on damage are needed for remote sensing, they may be formulated in a treaty governing earth resources satellites.

6. In addition to more detailed provisions regarding principles for the conduct of space activities, a treaty on earth resources satellites could provide for an international agency to deal with problems of remote sensing as well as any other international space problems upon which a consensus can be achieved.

V. A Treaty on Earth Resources Satellitss: CON

1. It is not practical to assume that another space treaty could result in adequate methods for meeting problems incident to an operational earth resources satellite system. As far as general guiding principles are concerned, a fundamental basis has already been laid in the Treaty on Outer Space so that this new environment is recognized as the province of all mankind and its use for the benefit of all countries. The United States, as the first nation to inaugurate the experimental ERTS program, has matched international law with a national policy announced by President Nixon that "this program will be dedicated to produce information not only for the United States but also for the world community."[2] This policy is consistent with that established in the U.S. National Aeronautics and Space Act of 1958 in which Congress declared that "activities in space should be devoted to peaceful purposes for the benefit of all mankind."

2. Space programs are planned, financed, and conducted by national governments and where international cooperation is concerned, more specific guidelines and organizational arrangements are furthered by bilateral and multilateral agreements. This method, particularly for operational projects such as meteorological and communications satellites, has proved effective. Weather satellite data is shared according to workable international arrangements made by nation states, and commercial space communications are governed by the International Telecommunications Satellite Organization (INTELSAT).

3. An international agency devoted to remote sensing problems, and established by treaty outside the framework of the United Nations, could hardly expect to take over satellite activities already organized along functional lines on an international basis, and yet some of these activities are closely linked with remote sensing. Therefore, the agency would be likely to have a limited jurisdiction, still further diminished because its terms of reference would not include problems arising from direct broadcast satellites, navigation satellites, the registration of space vehicles, and other uses for space technology which might develop in the future. Such an agency would, furthermore, have to develop special relations with those parts of the United Nations which already include satellites as a tool for functional problems such as weather, health, education, natural resources, and communication.

4. An international agency established within the United Nations to deal with earth resources satellites would find it difficult to accomplish its objectives when major space functions are already an integral part of such specialized agencies as the International Telecommunication Union, the World Meteorological Organization, UNESCO, the World Health Organization, and the Economic and Social Council with its interest in natural resources satellites.

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[2]Nixon, Strengthening the Total Fabric of Peace, Department of State Bulletin, October 6, 1969, p. 301.

5. Whether organized within or outside the United Nations, an international agency would have difficulty in financing its activities. It may be anticipated that nations which finance and operate satellites for many purposes would not wish to finance an international agency set up to regulate and control a few of their programs, particularly when more flexible alternatives are open to them.

6. Proposals for an international ERTS agency overlook the fact that problems which might be solved or mitigated by this new tool also require surveying by aircraft. A team of professionals responsible for surveying natural resources needs total information of an area, regardless of whether the information is obtained by means of planes or space vehicles. This method of procuring information is not a sufficient basis for establishing an international agency, particularly, when it is considered that its authority would be limited by the fact that spacecraft operate in outer space where all claims to sovereignty have been renounced by treaty, whereas planes operate in airspace where sovereignty prevails. How could total aerospace information be achieved? Scientists and engineers are mission-minded and have been outstanding as team workers in defining projects and organizing all relevant means for attaining agreed-upon objectives. Institutional arrangements should facilitate and not hamper such functional approaches to the solution of the earth's environmental problems.

VI. The United Nations Approach to Problems of Remote Sensing

For some years the United Nations has given attention to problems of remote sensing of the earth by satellites. The Economic and Social Council issued reports on the subject in 1970 and 1971, pointing out that ". . .resources satellites are expected to complement rather than replace already conventional techniques based on aircraft surveys, ground surveys and laboratory work for mapping and natural resources development. . . . . [Such] techniques [are] employed, for example, in scores of Special Fund projects being executed by the Resources and Transport Division."[3]

The Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee have also produced a number of basic studies on remote sensing which is "defined as a system of methods for identifying the nature and/or determining the condition of objects on the earth's surface and of phenomena on, below or above it, by means of observations from airborne and spaceborne platforms."[4] Panels have been established to implement research programs in remote sensing, the first being held in Ann Arbor, Michigan from May 3-14, 1971. Between September 13 and 17, 1971, a second

[3]United Nations Economic and Social Council. Development of Natural Resources, Natural Resources Satellites. UN document E/4779, February 4, 1970. p. 2. See also UN documents E/4779/Add.1, June 17, 1970 and E/4779/Add.2, January 12, 1971.

[4]UN Committee on the Peaceful Uses of Outer Space. Report of the United Nations Panel Meeting on the Establishment and Implementation of Research Programmes in Remote Sensing. UN document A/AC.105/98. January 20, 1972, 8 p. and 5 p. annexes.

panel was held in Rome on "Technical Consultation on the Application of Remote Sensing to the Management of Food and Agricultural Resources." The third panel, held in Sao Jose dos Campos, Brazil from November 29 to December 10, 1971, paid particular attention to remote sensing based on the emission and reflection of electromagnetic radiation. This type of approach indicates an awareness on the part of the United Nations of the necessity of basing any future plans on a firm foundation of factual knowledge concerning the science and technology of remote sensing. Furthermore, the professional knowledge of experts throughout the world is being sought on research and development in this area.

In approaching its first tasks, the UN Working Group recognizes the reasons why remote sensing of the earth by satellites is needed. The projected increase in the earth's population, coupled with a decrease in natural resources, creates the necessity for accurate maps and discovery of capabilities for supporting the people of the world. Increases in the rate of energy consumption also call for the conservation of existing sources and the exploitation of new reservoirs of energy. Remote sensing can be instrumental in planning for increased agricultural production and better use of water supplies. It is known that a limiting factor in the development of ERTS satellites will be the cost of the system to those who are using the data. Satellites and space platforms are expensive, and to this investment in space vehicles must be added the cost of processing astronomical amounts of data at ground stations, as well as its dissemination to experts who know how to use the information in solving problems. Full assessment of the potential benefits and limitations of remote sensing will provide a practical base for international law.

VII. A Problem for International Law

In looking toward the future of international law concerning outer space activities, there is a question of how many space treaties should be negotiated and come into force. Is a separate space treaty to be formulated for every major space problem, or is there to be a limitation on the treaty process as a means for solving problems? Each treaty is apt to have a different membership, and only a limited number of states could be counted as members of each space treaty. Are general principles in the Treaty on Outer Space to be repeated in provisions of subsequent treaties dealing with specific problems arising from space activities? If they are not repeated, then to what extent can dependence on treaty provisions be relied upon in contributing to the solution of international problems? Are all the treaties to be codified so there is a coherent body of international law on outer space matters? What are the emerging problems which might be dealt with under existing space treaties rather than new international agreements?

In analyzing these questions, it must be borne in mind that there are four types of international law concerning outer space: (1) law which applies solely to outer space; (2) law which applies to the earth, airspace and outer space as an environment; (3) law which

applies to functions performed in outer space and occasionally including airspace; (4) law which applies essentially to activities performed on the Earth as a consequence of the exploration and particularly the uses of outer space. Earth resources survey satellites come under this fourth type of international law. They are a new technological tool which is placed in outer space for functions which are entirely earth-oriented.

EARTH RESOURCES SURVEY SATELLITES AND THE OUTER SPACE TREATY+

*Stephen Gorove**

When the first artificial satellites were successfully placed into orbit carrying their unparalleled potential for the exploration of the moon and other parts of outer space, few people might have anticipated that the very same satellites would soon be used to explore mother Earth. After less than two decades of spacial experiments, scientists tell us about the practical applicability of satellites for surveying and remote sensing the resources of the earth. By employing high resolution television cameras and electronic sensing devices such satellites can scan the surface of the earth and provide information on electromagnetic radiation which is emitted both by hard and fluid substances. In this manner, the satellites may supply resource data on fisheries and monitor the biological productivity of lakes and seas. They may be used for mineral prospecting and surveying the state and distribution of major crops and provide yield estimates. They may furnish information on forest blight and timber volume and the extent of wind and flood damage, air and water pollution, and the growth of cities. All these developments and expectations, as well as many others which time and space do not permit me to dwell upon, seem to give us sufficient basis for the hope that with the use of earth resources survey satellites man will be in a better position to assess, develop and manage his resources and eventually control his own environment.[1]

The earth resources satellites, like many other innovations in our time, are the products of scientific and technological progress that led man into outer space. It is incumbent upon the legal technicians and policy makers to attempt to clarify the problem areas and provide a framework within which these new developments can take place with a minimum of friction.[2]

One of the initial queries which may be raised in connection with the wide spectrum of international legal problems pertaining to earth resources survey satellites is

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+This paper is an elaboration of the author's presentation before a regional meeting of the American Society of International Law which he chaired on April 8, 1972, at the University of Mississippi School of Law and of his address before the American Bar Association's Annual Convention on August 13, 1972, in San Francisco.

[1]On the technological capabilities and manifold uses of earth resources survey satellites, a wealth of information may be found in NASA as well as congressional publications. See, for instance, NASA, Office of Space Science and Applications, Earth Observations Programs Review, 4 and 5 November 1969 (1969); Earth Resources Satellite System, Report for the Subcommittee on NASA Oversight of the House Committee on Science and Astronautics, 90th Cong., 2nd Sess. (1965); NASA Authorization For Fiscal Year 1972, Hearings before the Committee on Aeronautical and Space Sciences, U. S. Senate, 92nd Cong., 1st Sess. 741, 940 (1971).

[2]There have been relatively few articles in the literature dealing with the legal implications of earth resources survey satellites. See, for instance, Brital, Survey From Space of Earth Resources, Proc. 13th Colloquium on the Law of Outer Space 197 (1971); Smirnoff, Survey From Space of Earth Resources, Proc. 13th Colloquium on the Law of Outer Space 203 (1971). In general, see also Brooks, New Developments in Earth Satellite Law, 65 Nw. U. L. Rev. 759 (1970).

the question of applicability of the provisions of the Outer Space Treaty.[3] In a purely tentative manner, two preliminary but diametrically opposed answers may be given. First, since there seems no indication that the drafters of the Treaty have considered the problem of earth resources survey satellites which came to the fore of international limelight and discussion after the completion of the Outer Space Treaty, it may be suggested that the Treaty provisions are not applicable to such satellites. Second, it may appear safe to assume, because of the broad overall scope of the Treaty that its provisions would be applicable to artificial satellites irrespective of any function which they may perform. The purpose of our inquiry is to scrutinize some of the most relevant Treaty provisions to determine whether or not they are applicable to earth resources survey satellites.

The reference in Article I of the Outer Space Treaty that the "exploration and use" of outer space shall be carried out for the benefit and in the interests of all countries may or may not be interpreted to apply to the use of earth resources survey satellites. From the wording of this provision it is not entirely clear whether "exploration" has to precede "use" or whether "use" must be accompanied by exploration.[4] Consequently, the use of outer space by such satellite without exploration of outer space and solely for exploration of earth resources may preclude applicability of the quoted provision. For analagous reasons one could also question the applicability of Article III and other articles of the Treaty[5] which similarly refer to "exploration and use" of outer space. What lends support to such interpretation is the fact that the drafters of the Treaty could easily have used the phrase exploration "or" use instead of the expression exploration "*and*" use but they have not. At the same time, it could be argued that the phrase "exploration and use" was not meant to be applied literally but should be interpreted to include any activity undertaken in outer space even though use is not accompanied by exploration of outer space but only by exploration of earth resources.

Similarly, it may be noted that freedom of scientific investigation "in" outer space which is guaranteed by the last paragraph of Article I of the Outer Space Treaty would be applicable to a scientific investigation of the earth despite the fact the earth cannot be regarded under the nomenclature used in the Treaty as a part of outer space. This line of reasoning may find support in the clear-cut wording of the Treaty which speaks about scientific investigation "in" outer space rather than scientific investigation "of" outer space. The additional point that must be clarified, however, relates to the place of investigation. Is an orbiting earth resource survey satellite engaged in scientific investigation "in" outer space? This question goes beyond the problem of precise delimitation of

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[3]The Treaty on Principles Governing Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (hereinafter referred to as "Outer Space Treaty" or, simply "Treaty") was signed on January 27, 1967, and entered into force October 10, 1967 (T.I.A.S. No. 6347).

[4]Cf. Gorove, Freedom of Exploration and Use in the Outer Space Treaty: A Textual Analysis and Interpretation, 1 Denver J. Int'l. L. & Pol. 93 at 97 (1971).

[5]See, for instance, Articles IX, X, XI and XIII of the Treaty.

boundary lines between air space and outer space. It relates to the determination of the location of functional activities performed by satellite instruments. Does the particular phase of activities involving investigation of earth resources by remote sensing devices on an orbiting satellite necessarily and always take place in outer space? Possibly not. If such be the case, under a literal interpretation, the provision pertaining to freedom of scientific investigation would not be applicable to the situation.

If Article III is interpreted to apply to the particular activities performed by earth resources survey satellites, it is still not entirely clear whether any country could legitimately object to the surveying of its naturel resources and the collection of other national data pertaining to its geography, hydrology, agriculture, climatic and other conditions. To be sure, international treaty law, including the United Nations' Charter, and international customary law, may prohibit such activities. However, at present there appears to be nothing in international law which could specifically be invoked as a prohibition of the type of activities performed by satellites surveying earth resources. Even if one extends his search to include resolutions of the United Nations General Assembly, the often recalled U.N. Resolution on Permanent Sovereignty Over Natural Resources does not seem to entail any specific limitation on the collection or dissemination of data pertaining to a nation's natural resources acquired by such satellites.[6]

On the other hand the general statement in Article III of the Space Treaty that spacial activities must be in the interest of maintaining international peace and security and promoting international cooperation and understanding, seems to point toward an overall obligation which the parties to the Treaty are required to observe. Undoubtedly, problems of interpretation regarding the meaning of these phrases and their invocation by national decision makers may lead to different conclusions in some cases.

Insofar as Article VII is concerned which provides for international liability for damage by a space object or its component parts, it is unlikely that this provision or the recently negotiated Liability Convention[7] would apply to damage which results from the use or disclosure of collected by by one state pertaining to the natural resources of another state. Damage, as it is used in Article VII of the Space Treaty, seems to imply direct damage caused by the space object and not damage which resulted from the intentional or negligent act of a party involving the use or dissemination of data.

The same conclusion would have to be drawn from Article I of the Liability Convention which defines damage as "loss of life, personal injury or other impairment of health; or loss of or damage to property of states or persons, natural or juridical, or property of international intergovernmental organizations." This is also made clear by Article II of the Liability Convention which speaks of damage caused "by" a space

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[6]G. A. Res. 1803 (XVII) of December 14, 1962.

[7]For a text of the proposed Convention on International Liability for Damage Caused by Space Objects (referred to as Liability Convention), see 8 U. N. Monthly Chron. 19-25 (1971). See also Current Documents section of this Journal, infra.

object.[8] Even if property were construed to mean more than proprietary interest to include economic, political or other national interests, the damage in these cases would not be done by the space object itself but by the activities of some person or organization subsequent to the survey accomplished by a satellite.

It is conceivable, of course, that the particular instrument used in the course of a satellite's surveying mission would emit substances (radar or laser beams) which might have harmful effects on health or might cause damage to property. In such case, the instrument used to accomplish the survey or remote sensing would be the cause of damage rather than any subsequent activity relating to the use of information or data acquired by the instrument. The only question which would have to be answered with respect to international liability would be whether to regard the instrument used for the survey as a "space object" since both under the Outer Space Treaty and the Liability Convention the injury or damage must be caused by a space object.[9] In this connection it may be noted that under the Liability convention the term "space object" includes component parts of a space object as well as its launch vehicle and parts.[10] What the Convention does not clarify is the meaning of a space object and its component parts. In view of this, it could be argued, for instance, that an instrument used in a satellite for gathering information about resources on earth is not a component part of the spacecraft and is not in itself a separate space object. Nonetheless, the preferable position would be to regard any object intended for use in outer space as a space object, and a camera or other instrument intended for such use and used for such purpose as a space object.[11]

Turning to Article VIII of the Space Treaty, it does not appear to contain any clue regarding the permissibility of the particular functions performed by earth resources survey satellites or the subsequent use or dissemination of the data collected. Jurisdiction and control over such satellites does not make such functions necessarily permissible.[12] Ownership of a gun does not imply permissibility in relation to its use in any situation.

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[8]Article II of the Liability Convention reads as follows:

> A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft in flight.

[9]Treaty, Art. VII; Liability Convention, Art. II.

[10]Liability Convention, Art. I (d).

[11]See Gorove, International Protection of Astronautics and Space Objects, 20 De Paul L. Rev. 597 at 607 (1971).

[12]Article VIII of the Treaty reads as follows:

> A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such objects, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State, which shall, upon request, furnish identifying data prior to their return.

Another provision, the introductory sentence of Article IX, stipulating that in the exploration and use of outer space the parties shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space with due respect to the corresponding interests of all other parties implies that the provision relates to "corresponding" interests in the exploration and use of "outer space" and not of the "earth". This position is also supported by other provisions of the same article which are concerned with "potentially harmful interference" with activities of other parties in the exploration and use of "outer space" and not of the "earth".[13]

More relevant to the use of earth resources survey satellites may be Article XI of the Treaty which stipulates that the parties conducting activities in outer space inform the Secretary General of the United Nations to the greatest extent feasible and practicable, of the nature, conduct, location and results of such activities. In turn, the Secretary General is required to disseminate the information immediately and effectively.[14] As we have noted beforehand, whether or not the earth resources data gathering function involves solely "activities in outer space" or also activities on earth may be an open question in some cases. However, if such function does only entail "activities in outer space", it is difficult to see on what basis a nation could object to the dissemination of data resulting from such activities. One point which may perhaps be argued is that the admitted purpose of Article XI is "to promote international cooperation in the peaceful exploration and use of outer space," and if the dissemination would not promote such purpose because a number of states were objecting to it, then the obligation imposed by Article XI would not be applicable. This, of course, would in no way imply any restriction on the party to disseminate the information.

One of the concluding thoughts which may be drawn from the preceding analysis of the more relevant provisions of the Outer Space Treaty is that the Treaty contains no stipulation prohibiting the use of earth resources survey satellites. More than that—as intimated beforehand—under a strict interpretation it could be argued that some of the Treaty provisions would not be applicable at all to such satellites. The only article which might be invoked to give some limited support to the objection to the use of satellites surveying resources of another state is Article III providing that activities in the exploration and use of outer space must be carried out in such a way as to promote international cooperation and understanding. Therefore, if the activities are objected to by a number of states and create international friction instead of understanding, they may be regarded as violating the spirit if not the letter of the Treaty. Against this argument stands the fact that the exploration relates not to outer space but to the resources of the earth. All in all, it would appear to be a circumspect policy for the United States to continue to explore and utilize whenever possible the bilateral or multilateral avenues of international cooperation.

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[13]For a discussion of Article IX of the Treaty, see Gorove, Pollution and Outer Space: A Legal Analysis and Appraisal, 5 N.Y.U.J. Int'l. L. & Pol. 53 (1972).

[14]Article XI of the Treaty.

Another conclusion that emerges is that not only does the use of such resources survey satellites seem permissible with no indication that any sovereign rights are violated but there equally appears no stipulation prohibiting the use and dissemination of the data collected. In fact, dissemination seems mandatory within the general conditions set forth in the Treaty, and it may be added that the policy of the United States, as enunciated in 1969 by President Nixon in a speech to the U.N. General Assembly pledging to share the data from the program and welcoming international cooperation in such space endeavor, has been in line with the conclusions arrived at.[15]

As a final concluding remark it may be pointed out that the eventual utilization of earth resources data collected by one state or its nationals through satellite observation does not appear to be such an act that may give rise to a legitimate claim for damages under the provisions of the Treaty or the Liability Convention.

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[15]For text of President Nixon's address on September 18, 1969, see 61 Dept. St. Bull. 297 (1969).

I.

*Draft Convention on International Liability for Damage Caused by Space Objects**

The States Parties to this Convention,

Recognizing the common interest of all mankind in furthering the exploration and use of outer space for peaceful purposes,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,

Taking into consideration that, notwithstanding the precautionary measures to be taken by States and international intergovernmental organizations involved in the launching of space objects, damage may on occasion be caused by such objects,

Recognizing the need to elaborate effective international rules and procedures concerning liability for damage caused by space objects and to ensure, in particular, the prompt payment under the terms of this Convention of a full and equitable measure of compensation to victims of such damage,

Believing that the establishment of such rules and procedures will contribute to the strengthening of international cooperation in the field of the exploration and use of outer space for peaceful purposes,

Have agreed on the following:

Article I

For the purposes of this Convention:

(a) The term "damage" means loss of life, personal injury, or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations;

(b) The term "launching" includes attempted launching;

(c) The term "launching State" means:

*Taken from 8 U.N. Monthly Chron. 19-25 (1971).

third State to seek the entire compensation due under this Convention from any or all of the launching States which are jointly and severally liable.

Article V

1. Whenever two or more States jointly launch a space object, they shall be jointly and severally liable for any damage caused.

2. A launching State which has paid compensation for damage shall have the right to present a claim for indemnification to other participants in the joint launching. The participants in a joint launching may conclude agreements regarding the apportioning among themselves of the financial obligation in respect of which they are jointly and severally liable. Such agreements shall be without prejudice to the right of a State sustaining damage to seek the entire compensation due under this Convention from any or all of the launching States which are jointly and severally liable.

3. A State from whose territory or facility a space object is launched shall be regarded as a participant in a joint launching.

Article VI

Subject to the provisions of paragraph 2, exoneration from absolute liability shall be granted to the extent that a launching State establishes that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it respresents.

2. No exoneration whatever shall be granted in cases where the damage has resulted from activities conducted by a launching State which are not in conformity with international law including, in particular, the Charter of the United Nations and the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

Article VII

The provisions of this Convention shall not apply to damage caused by a space object of a launching State to:

(a) nationals of that launching State;

(b) foreign nationals during such time as they are participating in the operation of that space object from the time of its launching or at any stage thereafter until its descent, or during such time as they are in the immediate vicinity of a planned launching or recovery area as the result of an invitation by that launching State.

Article VIII

1. A State which suffers damage, or whose natural or judicial persons suffer damage, may present to a launching State a claim for compensation for such damage.

2. If the State of nationality has not presented a claim, another State may, in respect of damage sustained in its territory by any natural or juridical person, present a claim to a launching State.

3. If neither the State of nationality nor the State in whose territory the damage was sustained has presented a claim or notified its intention of presenting a claim, another State may, in respect of damage sustained by its permanent residents, present a claim to a launching State.

Article IX

A claim for compensation for damage shall be presented to a launching State through diplomatic channels. If a State does not maintain diplomatic relations with the launching State concerned, it may request another State to present its claim to that launching State or otherwise represent its interests under this Convention. It may also present its claim through the Secretary-General of the United Nations, provided the claimant State and the launching State are both Members of the United Nations.

Article X

1. A claim for compensation for damage may be presented to a launching State not later than one year following the date of the occurrence of the damage or the identification of the launching State which is liable.

2. If, however, a State does not know of the occurrence of the damage or has not been able to identify the launching State which is liable, it may present a claim within one year following the date on which it learned of the aforementioned facts; however, this period shall in no event exceed one year following the date on which the State could reasonably be expected to have learned of the facts through the exercise of due diligence.

3. The time-limits specified in paragraphs 1 and 2 shall apply even if the full extent of the damage may not be known. In this event, however, the claimant State shall be entitled to revise the claim and submit additional documentation after the expiration of such time-limits until one year after the full extent of the damage is known.

Article XI

1. Presentation of a claim to a launching State for compensation for damage under this Convention shall not require the prior exhaustion of any local remedies which may be available to a claimant State or to natural or juridical persons it represents.

2. Nothing in this Convention shall prevent a State, or natural or juridical persons it might represent, from pursuing a claim in the courts or administrative tribunals or agencies of a launching State. A State shall not, however, be entitled to present a claim under this Convention in respect of the same damage for which a claim is being pursued in the courts or administrative tribunals or agencies of a launching State or under another international agreement which is binding on the States concerned.

Article XII

The compensation which the launching State shall be liable to pay for damage under this Convention shall be determined in accordance with international law, and the principles of justice and equity, in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, State or international organization on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred.

Article XIII

Unless the claimant State, and the State from which compensation is due under this Convention agree on another form of compensation, the compensation shall be paid in the currency of the claimant State or, if that State so requests, in the currenty of the State from which compensation is due.

Article XIV

If no settlement of a claim is arrived at through diplomatic negotiations as provided for in Article IX, within one year from the date on which the claimant State notifies the launching State that it has submitted the documentation of its claim, the parties concerned shall establish a Claims Commission at the request of either party.

Article XV

1. The Claims Commission shall be composed of three members: one appointed by the Claimant State, one appointed by the launching State and the third member, the Chairman, to be chosen by both parties jointly. Each party shall make its appointment within two months of the request for the establishment of the Claims Commission.

2. If no agreement is reached on the choice of the Chairman within four months of the request for the establishment of the Claims Commission, either party may request the Secretary-General of the United Nations to appoint the Chairman within a further period of two months.

Article XVI

1. If one of the parties does not make its appointment within the stipulated period, the Chairman shall, at the request of the other party, constitute a single-member Claims Commission.

2. Any vacancy which may arise in the Claims Commission for whatever reason shall be filled by the same procedure adopted for the original appointment.

3. The Claims Commission shall determine its own procedure.

4. The Claims Commission shall determine the place or places where it shall sit and all other administrative matters.

5. Except in the case of decisions and awards by a single-member Commission, all decisions and awards of the Claims Commission shall be by majority vote.

Article XVII

No increase in the membership of the Claims Commission shall take place by reason of two or more claimant States or launching States being joined in any one proceeding before the Commission.

The claimant States so joined shall collectively appoint one member of the Commission in the same manner and subject to the same conditions as would be the case for a single claimant State. When two or more launching States are so joined, they shall collectively appoint one member of the Commission in the same way. If the claimant States or the launching States do not make the appointment within the stipulated period, the Chairman shall constitute a singel-member Commission.

Article XVIII

The Claims Commission shall decide the merits of the claim for compensation and determine the amount of compensation payable, if any.

Article XIX

1. The Commission shall act in accordance with the provisions of Article XII.

2. The decision of the Commission shall be final and binding if the parties have so agreed; otherwise, the Commission shall render a final and recommendatory award, which the parties shall consider in good faith. The Commission shall state the reasons for its decision or award.

3. The Commission shall give its decision or award as promptly as possible and no later than one year from the date of its establishment, unless an extension of this period is found necessary by the Commission.

4. The Commission shall make its decision or award public. It shall deliver a certified copy of its decision or award to each of the parties and to the Secretary-General of the United Nations.

Article XX

The expense in regard to the Claims Commission shall be borne equally by the parties, unless otherwise decided by the Commission.

Article XXI

If the damage caused by a space object presents a large-scale danger to human life or seriously interferes with the living conditions of the population or the functioning of vital centres, the States parties, and in particular the launching State, shall examine the possibility of rendering appropriate and rapid assistance to the State which has suffered the damage, when it so requires. However, nothing in this provision shall affect the rights or obligations of the States parties under this Convention.

Article XXII

1. In this Convention, with the exception of Articles XXIV to XXVII, references to States shall be deemed to apply to any international intergovernmental organization

which conducts space activities if the organization declares its acceptance of the rights and obligations provided for in this Convention and if a majority of the States members of the organization are States parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

2. States members of any organization which are States parties to this Convention shall take all appropriate steps to ensure that the organization makes a declaration in accordance with the preceding paragraph.

3. If an international intergovernmental organization is liable for damage by virtue of the provisions of this Convention, that organization and those of its members which are States parties to this Convention shall be jointly and severally liable; provided, however, that:

(a) any claim for compensation in respect of such damage shall be first presented to the organization; and

(b) only where the organization has not paid, within a period of six months, any sum agreed or determined to be due as compensation for such damage, may the claimant State invoke the liability of the members which are States parties to this Convention for the payment of that sum.

4. any claim, pursuant to the provisions of this Convention, for compensation in respect of damage caused to an organization which has made a declaration in accordance with paragraph 1 of this Article shall be presented by a State member of the organization which is a State party to this Convention.

Article XXIII

1. The provisions of this Convention shall not affect other international agreements in force in so far as relations between the States parties to such agreements are concerned.

2. No provision of this Convention shall prevent States from concluding international agreements reaffirming, supplementing or extending its provisions.

Article XXIV

1. This Convention shall be open to all States for signature. Any State which does not sign this Convention before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time.

2. This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the United Kingdom of Great Britain and Northern Ireland, the Union of Soviety Socialist Republics and the United States of America, which are hereby designated the Depositary Governments.

3. This Convention shall enter into force on the deposit of the fifth instrument of ratification.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Convention, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary Governments shall promptly inform all signatory and acceding States of the Date of each signature, the date of each instrument of ratification of and accession to this Convention, the date of its entry into force and other notices.

6. This Convention shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article XXV

Any State party to this Convention may propose amendments to this Convention. Amendments shall enter into force for each State party to the Convention accepting the amendments upon their acceptance by a majority of the States parties to the Convention and thereafter for each remaining State party to the Convention on the date of acceptance by it.

Article XXVI

Ten years after the entry into force of this Convention, the question of the review of this Convention shall be included in the provisional agenda of the United Nations General Assembly in order to consider, in the light of past application of the Convention, whether it requires revision. However, at any time after the Convention has been in force for five years, and at the request of one-third of the States parties to the Convention, and with the concurrence of the majority of the States parties, a conference of the States parties shall be convened to review this Convention.

Article XXVII

Any State party to this Convention may give notice of its withdrawal from the Conven-

tion one year after its entry into force by written notification to the Depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.

Article XXVIII

This Convention, of which the English, Russian, French, Spanish and Chinese texts are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Convention shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

In witness whereof the undersigned, duly authorized, have signed this Convention.
Done in _____, at the cities of London, Moscow and Washington, the _____ day of _____, one thousand nine hundred and _____.

II.

AGREEMENT ON COOPERATION IN SPACE*

Agreement Between the United States of America and the Union of Soviet Socialist Republics Concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes

The United States of America and the Union of Soviet Socialist Republics;

Considering the role which the U.S.A. and the U.S.S.R. play in the exploration and use of outer space for peaceful purposes;

Striving for a further expansion of cooperation between the U.S.A. and the U.S.S.R. in the exploration and use of outer space for peaceful purposes;

Noting the positive cooperation which the parties have already experienced in this area;

Desiring to make the results of scientific research gained from the exploration and use of outer space for peaceful purposes available for the benefit of the peoples of the two countries and of all peoples of the world;

Taking into consideration the provisions of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and

*Republished from 66 State Dept. Bull. 924-5 (June 26, 1972).

Other Celestial Bodies, as well as the Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space;

In accordance with the Agreement between the United States of America and the Union of Soviet Socialist Republics on Exchanges and Cooperation in Scientific, Technical, Educational, Cultural, and Other Fields, signed April 11, 1972, and in order to develop further the principles of mutually beneficial cooperation between the two countries;

Article 1

The Parties will develop cooperation in the fields of space meteorology; study of the natural environment; exploration of near earth space, the moon and the planets; and space biology and medicine; and, in particular, will cooperate to take all appropriate measures to encourage and achieve the fulfillment of the Summary of Results of Discussion on Space Cooperation Between the U.S. National Aeronautics and Space Administration and the Academy of Sciences of the U.S.S.R. dated January 21, 1971.

Article 2

The Parties will carry out such cooperation by means of mutual exchanges of scientific information and delegations, through meetings of scientists and specialists of both countries, and also in such other ways as may be mutually agreed. Joint working groups may be created for the development and implementation of appropriate programs of cooperation.

Article 3

The Parties have agreed to carry out projects for developing compatible rendezvous and docking systems of United States and Soviet manned spacecraft and stations in order to enhance the safety of manned flight in space and to provide the opportunity for conducting joint scientific experiments in the future. It is planned that the first experimental flight to test these systems be conducted during 1975, envisaging the docking of a United States Apollo-type spacecraft and a Soviet Soyuz-type spacecraft with visits of astronauts in each other's spacecraft. The implementation of these projects will be carried out on the basis of principles and procedures which will be developed in accordance with the Summary of Results of the Meeting Between Representatives of the U.S. National Aeronautics and Space Administration and the U.S.S.R. Academy of Sciences on the Question of Developing Compatible Systems for Rendezvous and Docking of Manned Spacecraft and Space Stations of the U.S.A. and the U.S.S.R. dated April 6, 1972.

Article 4

The Parties will encourage international efforts to resolve problems of international law in the exploration and use of outer space for peaceful purposes with the aim of strengthening the legal order in space and further developing international space law and will cooperate in this field.

Article 5

The Parties may by mutual agreement determine other areas of cooperation in the exploration and use of outer space for peaceful purposes.

Article 6

This Agreement shall enter into force upon signature and shall remain in force for five years. It may be modified or extended by mutual agreement of the Parties.

Done at Moscow this 24th day of May 1972 in duplicate, in the English and Russian languages, both equally authentic.

For the United States of America

RICHARD NIXON

President of the United States of America

For the Union of Soviet Social Republics

A. N. Kosygin

Chairman of the Council of Ministers in the USSR

EVENTS OF INTEREST

There were several meetings of interest during the early part of 1972. There was a regional meeting of the American Society of International Law on "Earth Resource Satellites in International Law" on February 4-5 at the University of Santa Clara School of Law. The papers presented included the following: "The Technological Potential of Earth Resource Satellites" by Glenn Goodwin; "Legal Problems Created by Earth Resource Satellites in Overfly of the U. S." by George J. Alexander; "The Role of the United Nations in Earth Resource Satellites" by Mrs. Eilene Galloway; "International Problems of Earth Resource Satellites Data Concerning Resources in Foreign Countries" by Houston S. Lay.

Another regional meeting of the American Society of International Law was held on April 7-8, 1972, at the University of Mississippi School of Law. The subject of discussion was centered around "Earth Resources Survey Satellites and International Law." Among the topics discussed were: "The NASA Earth Observations Problem" by Robert O. Piland; "International Implications of Earth Resources Surveys by Satellites" by Dr. Franco Fiorio; "Should the United Nations Draft an Earth Resources Satellites Treaty?" by Mrs. Eilene Galloway; "An International Agency for Earth Resources Experiments" by George A. Codding, Jr.; "Technical and Legal Aspects of Environmental Monitoring" by Eugene Brooks; "The Space Shuttle: Investigation of Earth Resources by Manned Observatories" by John R. Tamm; and "Earth Resources Survey Satellites and the Outer Space Treaty" by Stephen Gorove. The presentations at this regional meeting, which were submitted in a written form, constitute the articles included in this issue of the *Journal of Space Law.*

In addition to the above mentioned regional meetings of the American Society of International Law the Inter-American Bar Association's XVIIth Conference held on April 24-28, 1972 in Quito, Ecuador, discussed in its "Committee on Space Communications" various comparative legal aspects of international legislation in America effecting terrestrial and space communications.

On August 13, 1972, during the annual meeting of the American Bar Association in San Francisco, its International Law Section's Committee on Aerospace Law and its standing Committee on Aeronautical Law co-sponsored a program under the joint chairmanship of John E. Cavanaugh and Martin Menter on "Satellite Surveys of the Earth's Resources—the Legal View." Professor Robert N. Collwell of the University of California discussed the scientific, Bernard H. White of the General Electric Company the legal aspects while Edward R. Finch, Jr. of New York City elaborated on the role of the United Nations. In addition, Robert T. Jensen of El Segundo touched upon the general implications, Dean George J. Alexander of the University of Santa Clara Law School on the domestic aspects and Professor Stephen Gorove of the University of Mississippi School of Law on the international legal implications of earth resources satellites.

Also, the Federal Bar Association, in cooperation with the U. S. Membership of the International Institute of Space Law, jointly sponsored the twelfth annual International

Symposium on Aerospace Law which was held on September 15, 1972, in Washington, D. C. The discussions at this meeting were devoted to current developments and problems in the field of space law. Discussants included Harold Berger, Mrs. Eilene Galloway, Mrs. Katherine Drew Hallgarten, Spencer M. Beresford and Brig. Gen. Martin Menter (USAF, Ret.).

The XVth Colloquim of Space Law was held on October 12-13 in Vienna. The topics of discussion in the program included:

1. Legal problems of earth resources survey by satellites;

2. Recent trends in the law of space telecommunications;

3. Legal problems arising from the interpretation and application of the Convention on Liability;

4. Next developments of space law and doctrine: new subjects in the law-making for outer space; development of the principle of responsibility for space activity; development of earth and space law; and divergencies and convergencies.

The 1973 Annual Meeting of the American Astronautical Society will be held from June 21 to June 23, 1973, in Dallas, Texas, as the "International Congress of Space Benefits." The overall theme of the meeting will be to show worldwide benefits, both current and projected, occurring from the application of space technology to human problems on earth.

The Sixteenth Colloquium on the Law of Outer Space is scheduled to be held from October 8 to October 15, 1973 during the next annual meeting of the International Astronautical Federation in Baku, U.S.S.R., on the Caspian Sea. The following subject matters are on the agenda: (1) Impact of Space Law on General International Law, (2) Legal Aspects of Direct Broadcast Satellites, (3) Legal Aspects of Earth Resources and Environment, (4) Legal Problems Concerning the Moon and Other Celestial Bodies, (5) Legal Regime of Earth Orbital Stations. Also during the meeting a Symposium is to take place on Space Law Teaching.

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EUROPEAN UNDERSTANDINGS IN THE APPLICATION SATELLITES FIELD AND THEIR LEGAL IMPLICATIONS+

*Dr. Hans Kaltenecker**

I. BACKGROUND

The importance of Europe's role in the promotion of space application satellites and space technology has increased considerably during the past five years. In stating this, it should be recognized that there still exists a great numeric difference between developments which have taken place in this respect in the United States and those which have occurred in Europe, at least as far as application satellites are concerned. Nevertheless, one should realize that space applications have developed in an immense form in Europe during this period, and that industry has begun to appreciate the commercial interest this field holds for it. Several study programs have been started and executed in European countries, in industry as well as in national institutions; for instance in the fields of telecommunications, air navigations control, meteorology and remote sensing of the earth. The European Space Research Organization (ESRO) has played an important role in this respect, as it has furthered research and study work in the field of space technology by placing contracts in industry with Member States for several years; it has thus contributed a considerable amount of knowledge and knowhow.

Europe possesses the necessary capacity to enter into bigger application projects. It is worthwhile to recall the political milestones which have marked the attempt to achieve this goal. After a first attempt in 1966-67 to prepare, based on a study made by ESRO, a regional experimental telecommunications satellite for Europe—the so-called CETS-C satellite[1]—national and bilateral projects were established, such as the French/German "Symphonie" telecommunications satellite and the Italian "Sirio" telecommunications satellite projects.

A further step forward was the reorientation given by its Member States to ESRO, which had already, during the first year of its existence, executed with success a number of scientific projects.[2] In December 1971, by decision of the ESRO Council, this Organization was authorized to enter into the field of large application satellites projects. It is quite clear that the principal aim of this decision must be seen against the background of the general consideration by the States that projects of this size should be

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+This article contains only the personal views of its author.

[1]It should be noted that CETS, which stands for "Conférence Européenne de Telecommunications par Satellites", was a conference of European States whose task was to prepare the INTELSAT negotiations and a European satellite telecommunications program. Its Secretariat was located in London until 1968, and was then transferred to the Secretariat of the European Space Conference.

[2]Between the date of creation of the European Space Research Organization and the present date, seven scientific satellites have been launched by this Organization, among which should be noted such advanced satellites, as the HEOS and the TD satellites.

executed in a wider international framework, taking into account both economic and efficiency aspects. The principal items of this decision, as made in December 1971, can be summarized as follows:

(a) ESRO will in the future undertake application satellite programs, in particular an Aeronautical Satellite Programme (AEROSAT), a Meteorological Satellite Programme (METEOSAT) and a Communications Satellite Programme that will comply with the requirements of the European Conference of Posts and Telecommunications Administrations (CEPT) and the European Broadcasting Union (EBU).

(b) The Member States participating in one or more of the above application satellite programs agreed, as an expression of the importance they attach to the application satellite programs within the framework of the Organization, that, during the period 1974-1980, an annual level of resources of not less than 70 MAU[3] (at mid-1971 prices) should be assumed for planning purposes.

(c) The Organization will pursue a scientific satellite program in which all Member States will participate and for which the annual level of resources for the period 1972-1974 shall be not less than 27 MAU (at mid-1971 prices), and the annual level of resources for the three years 1975-1977 has, for planning purposes, also been fixed at 27 MAU.

The Organization has furthermore been charged with a new coordinating and concerting role with respect to all space programs for peaceful purposes originating with the Organization and national agencies. For this purpose, the Organization shall collect all relevant information and disseminate it to the Member States, draw attention to gaps and to duplications and provide advice and assistance for the harmonization of both international and national programs; it shall also maintain regular contact with the users of space techniques and keep itself informed of their requirements.

The first consequence of the application of the principle of international cooperation in this field was the decision by the French Government to propose to ESRO Member States the internationalization of its METEOSAT project. In fact, after negotiations between this Government and ESRO the project became an international application satellite project. Its objective is the design, development, construction, placing in orbit, management and control of a pre-operational meteorological satellite (METEOSAT) and development and installation of associated ground facilities, with the aim of improving, in connection with the development of meteorology under the World Weather Watch program and the Global Atmospheric Research Programme (GARP), the services provided by the meteorological agencies.

A further application satellite program was agreed upon by European States, members of ESRO, namely the execution in cooperation with the United States, of an Aeronautical Satellite Program (AEROSAT). The objective of this program is the design,

[3]MAU refers to million units of account. A unit corresponds in value to U. S. $1.00. 1 Europa Year Book 1973, 259 (1973).

development, setting up and operation of a pre-operational system for air traffic control by means of satellites, with a view to improving air traffic services, in particular air-ground communications, over several areas of the globe.

In the field of telecommunications, different elements of a technical, legal and political nature delayed a decision on a satellite project, the definition phase of which has, nevertheless, already been started. It is hoped that this program, namely a regional European satellite project, will be agreed upon very soon. This program has, as its main objective, the design, development, construction and setting up of a space communications system, which would be put at the disposal of national postal and telecommunications administrations, and which would be capable of handling part of the intra-European public telecommunications traffic and the exchange of television programs.

Work is also in progress in the field of earth resources surveys. Several institutions in ESRO Member States are actively pursuing studies and ESRO itself has grouped together national experts to examine the results of these studies and to establish proposals for an earth resources survey program to be executed in the future.

Finally, European States grouped in ESRO are not neglecting the important role that maritime satellites may play in the near future. ESRO follows with interest the development in this field, in particular by means of close cooperation with the Intergovernmental Maritime Consultative Organization (IMCO). ESRO has established a special working group composed of national experts, who shall elaborate particular proposals for a project.

These are, described in a summarized manner, the present main undertakings in Europe in the application satellites field. It seems appropriate to turn now to the particular legal and administrative problems which arose from their preparation and execution, or which may arise later on during their performance.

II. LEGAL AND ADMINISTRATIVE PROBLEMS IN A REGIONAL SYSTEM

It should be pointed out that the satellite projects mentioned are to be considered as "regional" projects, *i.e.* they primarily serve the needs of a region like Europe, but they will execute the same functions as a global international satellite, such as INTELSAT. It seems that one can recognize a general tendency, certainly in the telecommunications field, to provide in the long run for only a few but very big satellites for global purposes, and also to provide for regional purposes particular satellites based on a highly developed terrestrial network containing ground stations with a minimum of maintenance requirements, and using frequencies of optimal use conditions. The political interest in regional satellites coupled with the fact that they offer to serve the particular requirements of a region like Europe lead to the conclusion that regional satellite systems will, in many areas, play an important role in the future.

The legal and administrative problems arising under such regional satellite systems are for many of them the same as for those which serve a global, world-wide purpose. For instance, to start with a typical case, the considerations and deliberations, undertaken at different places and in national and international committees, on the implications of remote sensing of the earth by satellite are applicable to global as well as to regional earth satellite systems. It is well-known that international law does not set up limitations in principle with regard to remote sensing on the earth by satellites; on the contrary, the Outer Space Treaty[4] encourages countries to undertake activities such as earth resources surveying and it states that there shall be freedom of scientific investigation in outer space, and that States shall facilitate and encourage international cooperation in the investigation of space. But Article IX of the Treaty on Outer Space also stipulates that these activities shall be executed with due respect to the corresponding interest of all other States parties to the Treaty and, in general, in accordance with international law and the United Nations Charter (Article III). The application of such principles requires the setting up of a legal regime for the study of national environment from outer space, which must include the protection of national sovereignty and security, the right of peoples to use freely and exploit their national resources, and the prohibition of acts designed to impede the exercise of the sovereignty of any State over its national resources.

It can be foreseen that for the purpose of a regional earth survey system the participating States conclude among themselves an international agreement providing for the right to exchange freely among themselves any relevant data and information arising from the investigations made by the satellite system concerned. Examples in this respect exist already.[5] However, the rapid development of technologies—and the results of certain programs such as the Earth Resources Technology Satellite (ERTS) programs clearly indicated this—may lead to a conflicting situation when information is obtained from the territory of a neighboring country which does not belong to the participants in the particular regional satellite program. In such a case, the international regime to be established would have to be made applicable. This is a typical example for a case of "intervention" by a general international rule into a regional satellite system.

Another area which international rules may have to regulate is the management of orbit positions. It seems that certain remote sensing systems require specific orbits in near-earth space for optimum performance and that this region of outer space can accommodate simultaneously a great number of spacecraft. However, as far as geostationary satellite orbit is concerned, it appears, according to studies made by the International Radio Consultative Committee (CCIR) which were approved during the last

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[4]Treaty on Principles Governing Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967 [Oct. 10, 1967], 18 U.S.T. 2410, T.I.A.S. No. 6347.

[5]See the Agreement of Rio de Janerio of January 18, and September 10, 1968, 19 U.S.T. 6060, T.I.A.S. 6569 and the Agreement of Tlatelolco of December 20, 1968, 19 U.S.T. 7809, T.I.A.S. 6613; and table of ERTS cooperative programs in International Cooperation in Outer Space: A Symposium, ed. by Elene Galloway, 92nd Cong., 1st Sess. Sen. Doc. 92-57, Washington 1971, p. 47.

Plenary Assembly of the International Telecommunications Union (ITU) held in New Delhi in 1970, that absolute limits of capacity of the geostationary orbit exist. Therefore, international regulations for the placing in geostationary orbit of earth resources satellites or their relocation will have to be established which must also be respected by the group of countries which has established the particular regional satellite system.

Developments in the telecommunications field also highlight the legal implications arising from the establishment of a regional telecommunication satellite system for Europe. In this respect a reference should be made to the INTELSAT Agreement and to the implementation of its Article XIV,c.[6] It might be recalled that, according to this provision, the parties to the Agreement can establish, acquire or utilize satellite space segment facilities distinct from the INTELSAT network. However, prior to this, the parties are obliged to submit all relevant information to the Assembly of Parties and shall consult it through the intermediary of the Board of Governors, in order to assure technical compatibility of the planned facilities with the INTELSAT space segment, and to avoid significant economic harm to the global INTELSAT system. The Assembly would then adopt the recommendation by a two-thirds majority with regard to the regional system envisaged.

It might be noted *inter alia* that the question of whether the above recommendation shall be made with a positive or a negative majority was discussed for a long time in Europe and has still not yet been settled. This procedure shows clearly the strong interface between international regulations and regional undertakings in this field. The European telecommunications program will, at least for its operational phase, be faced with this procedure at an appropriate moment. The ruling of the INTELSAT Assembly may have further consequences in that the United States Government may make dependent upon it its decision to supply US launchers for the orbiting of the satellites to be developed under the program. Indeed, the United States has always made it clear that a decision to provide such launchers will have to be made by the US Government by respecting its "international obligations", *i.e.* the commitments undertaken under the INTELSAT Agreement.

The European METEOSAT program referred to above also constitutes a good example of the interface between international rulings and regional undertakings by Europe. This program, however, will probably lead to problems of another category than those reported above. As already indicated, it forms part of a world-wide program (GARP) and it requires a considerable amount of coordination work which must be undertaken on the European side as well as by the other partners in the GARP system, *i.e.* the United States, Japan and possibly the USSR. This coordination work refers mainly to questions of coordination and compatibility between the different geostationary meteorological satellites. ESRO has proposed that the World Meteorological Organization (WMO) should play a significant role in this coordination work, and with this in mind, has concluded an agreement with WMO which provides, inter alia, for

[6]Agreement Relating to the International Telecommunications Satellite Organization INTELSAT, Aug. 20, 1971, T.I.A.S. No. 7532.

effective coordination of activities and procedures arising from such meteorological satellite programs, with a view to ensuring optimum benefits for meteorological operations and research.

Finally, the third European applications program, AEROSAT, which Europe hoped to start as the first of its important undertakings in the applications field, again shows clearly the strong connection between the international legal and administrative situation and such a regional program. It should be recalled, without going into any detail, that this program was planned, from the beginning, to be executed together with the United States and other partners, such as Australia, Canada and Japan. It was composed initially of an Integrated Program referring to the establishment of an aeronautical satellite segment over the Atlantic and Pacific Oceans, and the so-called Coordinated Program, including the establishment of ground facilities, the development and evaluation of necessary aircraft avionics and the establishment of a coordinated demonstration program by using the aeronautical space segment capability.

The legal framework in which the execution of this program was planned was established by a Memorandum of Understanding between ESRO as signatory on behalf of the participating European States, and by the United States Federal Aviation Administration (FAA) as signatory on behalf of the United States Government. It was envisaged that both agencies would be the main financial contributors to the Integrated Program. The sudden change in United States policy with regard to this program, consisting essentially of the desire to avoid the FAA becoming the owner of the space segment, led to the unfortunate situation whereby ESRO had already achieved the authority to sign this Memorandum at the beginning of 1972, whereas the FAA could not obtain this authority from the United States Government. It took a certain time to re-install confidence on the European side, and it was only in November 1972, after a decision by the ESRO Council to execute this satellite program alone or in cooperation with other partners, that the United States Government made a new proposal for re-opening negotiations on the basis of a new concept. This new concept foresees that the aeronautical space segment capability will be separately established under contractual arrangements whereby ESRO, Canada and a United States company become co-owners of this capability for at least the duration of the Memorandum of Understanding. The FAA, ESRO and Canada as signatories shall obtain the use of this capability with the FAA and ESRO obtaining equal portions. The FAA portion will be separately obtained by lease from the United States company.

Furthermore, the question of coverage of the Pacific Ocean will be the subject of a later decision; the space segment will be established initially over the Atlantic Ocean only. An AEROSAT Council, composed of representatives of the FAA, ESRO and Canada, will be established and will be the chief body responsible to the signatories for the execution of the program and will represent the whole range of operational and technical interests of the signatories. It is foreseen that other countries may join the Coordinated Program, the principal aims of which are still maintained. Therefore, it is hoped that Australia and Japan will also join this part of the program, and this will be an indication of the interest which the results of the evaluations may have later on for the Pacific region.

III. REVIEW OF THE ESRO CONVENTION

The above considerations refer mainly to the political and legal situation of the planned regional applications system, seen in the world-wide context in which they are placed. But there are further important questions which had to be solved or which are still under study inside Europe. One of the most important questions concerned the overall structure under which these programs were to be executed. It was clear from the beginning that the European Space Research Organization should serve as the focal point in this respect and that it should receive the mandate for reassembling all relevant ideas and information, and be the executive body for such programs on behalf of the participating States. But in order to ensure this, it was necessary to establish the relevant legal basic concept and the appropriate structure. This was of particular importance because the actual text of the ESRO Convention stems from the idea of unity of program and membership. Indeed, the participation in ESRO was, under the present Convention, linked with the participation in all programs agreed to under it. It was therefore decided to review the ESRO Convention to take account of the reorientation of the program concepts with a view to allowing certain Member States, but not all, to participate in particular programs. The amendments proposed to the Convention of ESRO take into account this new concept and it is foreseen that Member States may declare themselves not interested in particular programs. A Protocol to be annexed to the ESRO Convention will state the detailed terms and conditions under which this new concept can be implemented.

Another important aspect which had to be examined in the same context was the role of Member States and their representatives with regard to the supervision of such activities. The Council of the Organization is composed of representatives of all Member States and it remains the supreme legal body of the Organization. Further rules had to be defined to allow representatives of Member States participating in a particular program to assume direct responsibility for such a program. It was therefore agreed to establish, as an *interim* measure and with a view to their institutionalization in the revised Convention, so-called Program Boards in which only representatives of countries participating in the particular program are allowed to vote on questions relating exclusively to that program.

Furthermore, the Organization had to find an *interim* solution in order to implement with immediate effect the above principles and concepts. As they can only enter into force formally after approval by all Member States of the amendments to the Convention as suggested, it was necessary to devise a system whereby immediate implementation would be possible. Therefore, for each of the application programs mentioned, an internal European Arrangement has been drawn up, under which the Member States participating in the particular application program establish among themselves and the Organization the relevant rules and conditions for participation in and execution of the program. The Council of the Organization has been invited in each case to accept that the Organization executes the program in accordance with Article VIII of the present text of

the Convention.[7] This *interim* solution permitted Europe to embark upon the most important application projects it had ever undertaken without awaiting the formal approval or ratification of the amendments to the ESRO Convention. In fact, the actual so-called special application projects will become, after this approval or ratification is obtained, the optional programs of ESRO. This example shows the legal flexibility which is sometimes required in order to set up an appropriate legal basis and framework for such important undertakings.

IV. EUROPEAN SPACE POLICY FOR THE FUTURE

A final word should be said with regard to the future European space policy and organizational structure as envisaged by the European Space Conference held in Brussels in December 1972. It was agreed that a new European Space Agency should be built up out of ESRO and ELDO (the European Launcher Development Organization), but it was also confirmed that the present undertakings subscribed to within ESRO should not be placed in danger by this, and that the principles and rules foreseen in the revised ESRO Convention shall also serve as a basis for the drawing up of the Convention of the new European Space Agency. It can therefore be expected that the general lines of conduct, in particular with regard to application programs in Europe, as well as the legal framework in which they will be planned and executed, will also be maintained in the future.

A particular aspect which remains to be studied is that of the future use of the satellite networks and their operational phases. At present, the AEROSAT, METEOSAT and Telecommunications programs are considered to provide for experimental and pre-operational data only; but the long term aim is of course to arrive at a certain moment, in the light of experience gained, at an operational use of these systems. In principle, ESRO has not envisaged operating satellites other than its scientific ones for non-experimental purposes, but it can nevertheless be called upon to operate application satellites if so requested by the future users and if this is accepted by its Member States. Nothing in the revised draft Convention of ESRO speaks against such a solution, but particular arrangements with the future user organizations will have to be established should such an activity be decided upon. The solution to this will probably be found within the framework of the future European Space Agency and therefore a final solution to this problem cannot yet be envisaged.

It is hoped that the above considerations will give the reader an overall impression of the particular legal and administrative problem that Europe has encountered in the field of application satellites.[8]

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[7] See "Basic Texts, Rules and Regulations, Agreements of the European Space Research Organization" (Doc. ESRO/SP-4, March 1969).

[8] It should be mentioned that this article does not take account of the many international legal implications that the new Spacelab program of the European Space Research Organization may have. This program, which is undertaken as the European participation in the U. S. program regarding space transportation and orbital system, will include many application aspects. Indeed, the laboratories to be established will be suitable for conducting research and application activities on shuttle sortie missions. Work is in progress in ESRO, in cooperation with NASA, to establish the appropriate legal international framework for the execution of this new and challenging program.

THE FORMAL LEGAL STATUS OF LUNAR STATIONS

*Adrian Bueckling**

I. INTRODUCTION

The fascinating Apollo Program has been brought to a brilliant conclusion by the Apollo-17-Mission. This means, however, that—taking into consideration a long period of time—the lunar research projects have only come to a temporary end. In the course of technological development, there will be further landings on the moon, especially after space shuttle systems have proven their usefulness. The installation of stationary operation bases (manned and unmanned) on the moon will, among other things, constitute a further step toward the exploration of our nightly companion. Under consideration for the future are projects providing for space tug missions to the moon, consisting of cylindrical parts that are put together in the manner of a box of bricks to make up several station bodies for living, working, drilling, mining and research, thus forming a moon colony.

It therefore does not seem premature to raise questions about the legal status of these lunar stations, all the more as a minor system of the so-called Apollo Lunar Surface Experiments Package (ALSEP) has already been set up. This device has proved to be practicable and will broadcast scientific data to the Earth during the next several years.

This article will deal only with the formal legal status of such stations[1] and thus will not deal with legal problems resulting from *activities* of the stations or relating to the legal *internal regime* of a station, such as command or general organizational framework.[2]

II. LEGAL STATUS

The question of the legal status of a moon base should be considered primarily in the context of the Space Treaty of January 27, 1967,[3] which—incidentally—represents

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[1]See G. Gal, Space Law 209 (1969); I. H. Ph. Diedericks-Verschoor, Legal Aspects of Laboratories on the Moon, Proc. 14th Colloquium on the Law of Outer Space 24 (1971) [hereinafter cited as 14th Colloquium]; M. Markoff, Orbiting Laboratories and Earth Environment Survey, 14th Colloquium 12; M. Niciu, Considérations Sur La Régime Juridique des Laboratories Lunaires, 14th Colloquium 27; M. Smirnoff, The Legal Status of Orbital Laboratories as the Next Step to the Development of the Collaboration Between the Cosmic Powers, 14th Colloquium 22; I. Von Muench, Grundfraggen des Weltraumrechts, Archiv des Voelkerrechts 170 (1959); G. Zhukov, The Legal Regime for the Moon, 14th Colloquium 50.

[2]See G. Robinson, NASA's Space Station and the Need for Qualifiable Components of a Responsive Legal Regime, 14th Colloquium 33.

[3]See A. Meyer, Der Weltraumvertrag, Zeitschrift für Luftrecht und Weltraumrechtsfragen 65 (1967) [hereinafter cited as ZLW]; M. Wollenschlager and H. Hablitzel, Der Weltraumvertrag 27 (1967); Festschrift for G. Kuechenhoff, Recht und Staat 869 (1972).

not only the international treaty law applicable between the contracting States but also the *basic rules* which can be considered as general international law, both from the viewpoint of international customary law as well as the fact that they have been recognized by the overwhelming majority of States.[4]

Under the provisions of the Space Treaty, the erection of lunar stations cannot establish any *territorial* claims of sovereignty concerning the surface of the moon. According to Article II of the Treaty, outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation. Naturally, this provision has to be construed as to also include the prohibition of the appropriation of *parts* of the moon's surface, or her underground. However, the Space Treaty permits the *use* of celestial bodies in the national interest, though within the framework of the common clauses of Articles I and IV of the Space Treaty. National operational bases on the moon will raise legal status problems, the solution to which—under the rule of the prohibition of appropriation relating to national sovereign competences—will have to be searched for by looking *underneath* the *surface.*

Insofar as the status of space objects is concerned, the Space Treaty establishes personal and substantive sovereign competences. This results from the provisions of Article VIII of the Treaty regulating the status as follows:

> Sentence (1): "A State Party to the Treaty on whose registry *an object launched into outer space* is carried, shall retain jurisdiction and control over such object, and over any personnel thereof. . .".
>
> Sentence (2): "Ownership of *objects launched into outer space, including objects* landed or constructed on a celestial body . . . is not affected by their presence in outer space or on a celestial body . . .".

Hence, also in connection with Article XII of the Space Treaty, it should be clear that the above-cited sentence (2) concerning *rights of ownership* of space objects applies, among other things, to equipment in a lunar installation; for such equipment means "objects constructed on a celestial body" within the meaning of sentence (2).

While the *status claims* (registration, administration, control, and jurisdiction) as set forth in sentence (1) apply to "objects launched into outer space", they do not necessarily apply to *equipment stationarily* erected on the moon surface which, in the further course of technological development, might possibly be constructed not only from "objects launched into outer space" but also at least partly from *lunar* materials. This question should be answered in the affirmative on the basis of an interpretation of Article VIII (which relates to the meaning and purpose of the Space Treaty), since the concept of an "object launched into outer space" in the terminology of the Space Treaty (and also indicated by the word "including") is to be understood as a *general concept* covering all objects made by man *in* and *for* outer space.

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[4]M. Dauses, Bestehen und Inhalt von Weltraumgewohnheitsrecht, ZLW 267 (1971); S. Gorove, Criminal Jurisdiction in Outer Space, 6 Int'l Lawyer 313, 318 (1972).

Article VIII of the Space Treaty, thus applicable also to stations, makes evident without expressly mentioning the term that the Space Treaty is founded on the principle of *nationality* which underlies the legal regime governing the status of space objects (including stations). The same principle governs also the Liability Convention of 1972. The status of a lunar station is, hence, determined by its connection with a certain State, *i.e.,* by its nationality.[5]

Article VIII of the Space Treaty also involves the question of how nationality is *assigned.* This is done by entering the station in a *national* registry and—according to the general principles of law—by granting the station a license for navigation. Contrary to the regulations for aircraft, this is done irrespective of whether it is a *civil* or a *State* station. When doing so, each State—according to its own law—determines the conditions under which entry in the national registry is to be carried out. However, the States are not allowed to fix these conditions at their own discretion; they rather have to conform to treaty or international law.[6] The current law does not yet provide for an obligatory registration in an *international* registry.[7]

According to the general rules of the Space Treaty, both the entry of a station in a national registry and its license for navigation are connected with the granting of the nationality mark *identifying* the station as a registered national installation unit.

Such an assignment—as in the case of ships and aircraft—has the following three legal effects:

1) From the viewpoint of *governmental law:* the right of the Flag State to administer the station as part of its own territory, and to control and exercise jurisdiction over it (see Art. VIII of the Space Treaty);

2) Acceptance of responsibility for the station and the persons therein; further, the guaranty to observe contractual or general international obligations as well as good behavior to be measured by international standards, including, among other things:

   a) liability for damages, and

   b) responsibility for qualifications of the personnel and for their activities;

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[5] See M. Bodenschatz, Bericht über den VII Congress of the IAF-1966, ZLW 45 (1967); A. Bueckling, Zur Rechtsstellung in Erdumlaufbahnen Befindlicher Weltraumstationen, ZLW 1 (1973); G. Gal, Space Law 209 (1969).

[6] W. Schwenk, Grundlagen fuer die Verleihung der Staatszugehoerigkeit an Luftfahrzeuge, ZLW 197 (1965).

[7] See I. H. Ph. Diedericks-Verschoor, The United Nations and the Registration of Spacecraft, Proc. 13th Colloquium on the Law of Outer Space 142 (1970).

3) From the viewpoint of international law: a defense to the exercise of foreign sovereign rights over stations of recognizable nationality (argument taken from Article XII of the Space Treaty).

As to the last point, it should be noted that the defense to the exercise of foreign sovereign rights over stations of recognizable nationality is not restricted by Article XII of the Space Treaty. This Article provides that all stations and equipment on the moon shall be open to representatives of other States on a basis of *reciprocity only*, a regulation which is self-explanatory, even without the provision of Article XII of the Space Treaty.

Therefore, the Space Treaty consciously provides lunar stations with more pronounced status rights than, for example, the Antarctic Convention does in the case of Antarctic stations. Unlike space stations, according to Article V (3), of the Artarctic Convention, Antarctic stations can be visited by observers of all contracting States *at any time.*[8]

III. REGISTRY

Modern large-scale research projects in the field of space navigation have given rise to numerous international organizations and to cooperation on an international level. Such cooperative activities are bound to influence in a decisive manner the conventional forms of international cooperation, thus raising questions about status which are not sufficiently answered by the Space Treaty.

First, it should be pointed out that both the Space Treaty (Articles VI and XIII) and the Liability Convention (Article XXII) require the admissibility of the operation of moon stations by international operating agencies

a) either in the form of *joint* (multilateral) operating agencies,

b) or in the form of *international organizations.*

Article XIII of the Space Treaty in this connection rules that the provisions of the Treaty shall apply also to international organizations. It is not clear what this regulation means with regard to the manner of registration of international operating agencies. Article VIII of the Space Treaty mentions *only* entry in the national registry of one State; as to international agencies, therefore, entry neither in an *international* nor in a *joint* registry carried by the States concerned is provided for. The content of Article VIII of the Space Treaty apparently conforms to the provisions of Article 18 of the Chicago Convention applying to civilian aircraft, according to which civilian aircraft cannot be validly registered in several States.

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[8] See N. Matte, Aerospace Law 265, 317 (1969); A. Schweickhardt, Der Heutige Stand des Weltraumrechts in Seinen Wesentlichen Grundzeugen, ASDA Bull, 53 (1970).

This regulation seems to be insufficient. In this connection, reference should be made to recent developments in the field of air navigation as manifested by the Resolution of the Council of ICAO passed on December 14, 1967. This Resolution (including Annexes) provides (concerning civilian aircraft) that international operating agencies (either in the form of joint operating agencies or in the form of agencies of international organizations) shall be entered into a registry which shall be *jointly* established by the States concerned but carried by *one* State. The aircraft thus entered in a joint registry shall not bear the nationality mark of the State carrying the registry but it shall bear a *joint* mark. Regardless of this, it is considered that each aircraft shall have the nationality of each of the States establishing the international operating agency. It is recommended that similar provisions also be created for outer space navigation.

The framework of the registration procedure should make clear which State's law is to be applied to the international operating agency concerned since the exercise of judicative and executive powers over individual member States and their nationals is—especially in the case of international organizations—a very complex legal problem which, in view of ambiguous statutory provisions, especially under the so-called "implied power" interpretation, is apt to raise numerous and intricate questions in each particular case.[9]

IV. CONCLUSIONS

According to Article VIII of the Space Treaty, the above described legal status of moom stations is applicable only to the *installation* itself, *i.e.*, neither to the lunar surface actually occupied by such installation nor to the operation and supply area around the installation or between the individual component parts of a multi-member station. The question should, therefore, be asked if it could be concluded from other legal considerations that the *vital* supply and operation area of a station (station environment) shares the legal destiny of the station.[10] An affirmative answer to this question results from both the station concept and the circumstance of actual effectivity. The concept of the station includes operability and viability of the station. Affecting the operation of a station by sharing the use of its operation and supply area with other States would limit the right of *free and unrestricted use* of outer space (Article I of the Space Treaty.) Such a sharing of a station's operation area with other States is not allowable for this reason. To the extent to which the use of an operation area surrounding the station is thus illegal for other States, it is only a matter of consistency to extend the legal status of the station also to its environment. The same legal consequence also results from the circumstance of actual effectivity.[11] The flag identifying the nationality of a station waves over station *and*

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[9] See I. Seidl-Hohenveldern, Das Recht der Internationalen Organisation einschliesslich der Supranationalen Gemeinschaften, N. 114. 1026, 1564, 1603 (1967).

[10] Compare S. Gorove, Criminal Jurisdiction in Outer Space, 6 Int.l. Lawyer 313, 321 (1972).

[11] P. Sontag, Der Weltraum in der Raumordnug des Voelkerrechts 270 (1966).

ground![12]

The assignment of lunar ground and soil to the status of a station demonstrated by flags or sovereignty emblems, however, under the rule of the prohibition of occupation does not imply any *territorial* competences of sovereignty; the operational environment rather shares with the station only its *installation status* including the status rights set forth in Article VIII of the Space Treaty. Environmental zones of a station lying *beyond* actual effectivity in the sense of "contiguous zones" can be covered by a station's legal status just as little as the so-called spheres of interest which, in view of lunar morphology, are limited by the edges of craters.[13] The actual limit of a station's status rights at any time is the right of other States to free access to all regions of the moon as guaranteed by the Space Treaty. This, by the way, is provided for also in Article II of the draft treaty concerning the moon prepared by the USSR, which actually does not announce anything new but rather clarifies the provisions of the Space Treaty.[14]

However, no one can overlook the danger that the prohibition of occupation is practically set aside by the aforementioned legal status of insular national zones of use. Flags and sovereignty emblems are bound to assign and exclude. They will thus tend to establish that archaic motive of conflict between States which A. Mitscherlich describes as being again and again a rivaling claim to territory: "Even though the conflict does not start with this aim, it will inevitably end up in a struggle for independence of a territory, that is, for its governmental and political sovereignty."[15] Even in this, our sober world, national flags continue to be elements of juridical symbolism; by being "public signs of order", they establish sociological substrates which, as a rule, will not exist without legal consequences.

This leads to the crucial question—raised already by E. Brooks[16]—of how the exercise of actual controls over parts of the lunar surface can be prevented from eventually developing into quasi-territorial structures. With the conclusion of the Space Treaty, the chance was missed to either internationalize the moon and other celestial

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[12]See also National Aeronautics and Space Administration Authorization Act 1970 § 1E, 31 U.S.C. § 699, §§ 5, 6, 42 U.S.C. § 2459, 2462 (1969), Publ. No. 91-119 (Nov. 18, 1969), 83 Stat. 196; A. Bueckling, Der Mord in Automatismus von Souveraenitaetsstrukturen, Deutsche Richterzeitung 157 (1971); A. Bueckling, Flaggen auf dem Mond, ZLW 19 (1970); M. Marcoff, Traite de Droit International Public de L'Espace 662-65 (1973).

[13]P. Sontag, Der Weltraum in der Raumordnung des Voelkerrechts 270 (1966); G. Zhukov, Weltraumrecht 307 (1968).

[14]See E. Brooks, Prospects for Legal Progress on Celestial Bodies, 14th Colloquium 181 (1971); E. Galloway, The Future of International Cooperation in Treaty Making, 14th Colloquium 204 (1971).

[15]A Mitscherlich, Die Idee des Friedens und die Menschliche Aggression 21 (1969).

[16]E. Brooks, Prospects for Legal Progress on Celestial Bodies, 14th Colloquium 181, 192 (1971); E. Galloway, The Future of International Space Cooperation in Treaty Making, 14th Colloquium 204 (1971); N. Matte, Aerospace Law 313 and 360 (1969).

bodies or place them under the trusteeship of the United Nations *from the very beginning* [17] I share Mr. Brooks' view that the problems resulting from the prohibition of occupation can eventually be solved satisfactorily only under the rule and control of an international organization. The permanent use of celestial bodies should be permitted under international licenses only; manner, site, and duration of the use should be subject to international procedures of registration, assignment, and permission. Such a regulation would help to realize the intent expressed in Article I of the Space Treaty: namely, to develop outer space into a common space for all States, in a most reasonable way. As to operation and working method of such an international authority, reference can be made to the International Telecommunication Union, an agency of the United Nations, one of the main tasks of which is to allocate radio frequencies by assigning or blocking certain wave-lengths.

Space law experts all over the world should lose no time in marshalling their efforts to prevent the establishment of undesirable legal regimes in outer space which could not be eliminated at a later time.

[17] See also G. Kuechenoff, Naturrecht und Liebesrecht 126 (1962); G. Kuechenoff, Rechtsphilosophische Grundlagen des Kosmischen Rechts, Archiv fuer Rechts und Sozialwissenschaften 466 (1965).

THE PROBLEM OF SECURITY IN OUTER SPACE IN LIGHT OF THE RECENTLY ADOPTED INTERNATIONAL CONVENTION ON LIABILITY IN OUTER SPACE

*Dr. Michael Smirnoff**

Today, in international law, the problem of security has acquired a new dimension. With the conquest of the air, and now of outer space, there has come the new notion of "security in the vertical sense".

The problem of security in air space is now sixty years old, and many books and articles have been written on this subject. In recent times international literature has dealt especially with the problem of security in outer space. One could argue that the existence of some 2,000 artificial satellites does not justify the establishment, for the huge region of outer space, of some special measures for security. However, we contend that the number of artificial satellites, spaceships and special laboratories for outer space research is becoming more and more important, and a direct danger of colliding space craft ceases to be merely a remote consideration. Such collision could occur between spacecraft themselves or between spacecraft and conventional airplanes in the air space at the moment of take-off of spacecraft or before their passage into orbit.

In this connection, it should be noted that the problem of delimitation of air space and outer space is still not solved. Our proposition at the London Colloquium on International Space Law,[1] to solve this problem by the establishment of a common legal regime for air- and spacecraft, remained merely a proposition.

Opposition to our solution for the delimitation of air and outer space was justified by the then existing enormous difference between the technological and legal aspects of air and space flights. But, with the development of mixed air-space lines which will begin at one point on earth and then pass rapidly through outer space to another point on earth, a common legal regime would provide a convenient substitute for two different legal systems for the same craft and same activities.

Security in outer space becomes even more important in all its aspects, particularly in view of the need for a set of measures to reduce the chances of direct collision. The regulation of all activities in outer space to avoid international conflicts on earth, leaving aside possible conflicts with intelligent living beings that may be found in outer space, enhances the need for such measures.

In circles which for the past fifteen years have dealt with the problems of outer space, the problem of security has been identified with the problem of liability. The solution to the problem of liability, without a doubt, should diminish the possibilities of

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[1] Proc. 2nd Colloquium on the Law of Outer Space 152 (1960).

conflicts in outer space. Although the complete identification of the problem of security with the problem of liability cannot be carried to the extreme, it is clear that inclusion in international legal documents of all activities which create not only liability for compensation of damages but also require interdiction, would go far toward the relaxation of relations in outer space. In this respect, the basic document for the legal regulation of relations in outer space is the Space Treaty of 1967,[2] which has foreseen a whole set of activities of a non-peaceful character and has explicitly forbidden such activities.

Also, we should be reminded that within the framework of the International Astronautical Federation[3] and the International Institute of Space Law there had existed for some time a committee for liaison between technical and legal experts on the problems of outer space.[4] This committee had exactly determined the activities which by their nature could be harmful in outer space. The list of activities was prepared at the same time when the interstate organizations officially produced the International Convention on Liability in Outer Space.[5]

The Convention has been on a list of problems ever since the very beginning of the attempts to solve such problems legally through the United Nations. The Space Treaty of 1967 merely outlined the general solution to the problems of liability of States in outer space and, therefore, had to be expanded by putting more detailed norms in what became the Liability Convention. It may be recalled that as far back as 1959, this problem of spelling out the details was put on the agenda of the U. N. Ad Hoc Committee for the Peaceful Uses of Outer Space. Later, in 1962, a permanent Committee on the Peaceful Uses of Outer Space was established by the United Nations with its legal and technical subcommittees. The Space Treaty of 1967 was the basic legal document from which came the detailed drafts of two conventions: the Agreement on the Rescue and Return of Astronauts (1968),[6] and the Convention on Liability in Outer Space (1972).

The latest points of concern for the Legal Subcommittee of the permanent U. N. Committee are in the preparation of drafts for a new convention on the registration of

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[2]Treaty of Principles Governing Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, signed January 27, 1967, entered into force October 10, 1967, [1967] 18 U.S.T. 2410, T.I.A.S. No. 6347.

[3]The International Astronautical Federation was founded in 1950. It is presently dealing with research on the technical aspects of astronautics. The International Institute of Space Law was created within the framework of the International Astronautical Federation in 1960. The task of the International Institute of Space Law was to study the legal problems of outer space. Its first director was the author of this article.

[4]The Liason Committee, presently under the chairmanship of Dr. Manfred Lachs, a Polish lawyer, has representatives from the astronautical field as well as lawyers who primarily deal with the problems of outer space.

[5]For a text of the Convention on International Liability for Damage Caused by Space Objects, see 8 U.N. Monthly Chron. 19-25 (1972).

[6]Agreement on Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched Into Outer Space, U.N. Doc. A/Res/2347 (XXII), January 16, 1968, entered into force December 3, 1968, [1968] 19 U.S.T. 7570, T.I.A.S. No. 6599.

space craft and for a special convention on the legal status of the moon.

The convention which interests us particularly in this article is the International Convention on Liability for Damages Caused by Space Objects.[7] This Convention was the fruit of lengthy studies in the Legal Subcommittee and, in many semi-official and non-official lawyers' organizations. As an example, we should point out that as far back as 1960, during the Third Colloquium on the Law of Outer Space, the problem of liability was debated in the International Institute of Space Law. As a separate question presented in an introductory report by Professor Pepin of France, the Colloquium gave rise to a very ample discussion of the problem at the above mentioned meeting of the Institute in Stockholm.[8]

The problem of liability for damages caused in outer space, as a measure of the increase of security in outer space, had not only legal and technical aspects but was also narrowly linked with the financial aspect of that question. The clearly declared desire to save mankind from damages caused by spacecraft had inevitably an economic side as well. This consisted of the fact that financial means had to be found for the insurance of liability, without which the latter could become a dead letter because of the huge amounts of damages that might result from the different activities of spacecraft.

In the Legal Subcommittee several initial drafts were submitted by Belgium, the United States, Hungary, India and Italy. After many years of discussion of those drafts the Legal Subcommittee finally, on June 28, 1971, adopted a definite text. This draft was sent to the General Assembly of the United Nations during its 26th Session and the Assembly adopted, on November 29, 1971, the Convention in its final form. Ninety-four countries voted for the adoption; no vote was cast against the Convention, while there were abstentions only by Canada, Japan, Iran and Sweden. On March 29, 1972, twenty-three countries signed the Convention, and now its ratification is proceeding.

The Convention, with its twenty-eight articles, represents the quintessence of international thought on the problem of liability in outer space as founded upon the basic Space Treaty and the Agreement on the Rescue and Return of Astronauts. But, in its twenty-eight articles, the new Convention remains merely an enlargement of the considerations presented in the two earlier texts.

To respond to its basic task, the increase of security in outer space, the Convention had to create very precise definitions of the notions with which it operated. Thus, in Article I, it gave definitions of the following terms: damages, launching, the launching state, and space object. Although some of these definitions have already been attacked for their insufficient precision, they are very welcome news in the practice of interna-

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[7] I. H. Ph. Diedericks-Verschoor, The Convention on International Liability for Damages Caused by Space Objects. Proc. 15th Colloquium on the Law of Outer Space 19 (1973).

[8] Proc. 3rd Colloquium on the Law of Outer Space 131-37 (1961).

tional conventions on space law.[9]

The basic principle of the Convention is absolute liability of countries for all damage caused by their spaceships on the ground or to aircraft in flight. We are dealing here with so-called "absolute liability", whereby states are always liable even in cases of "*force majeure.*"

The principle of liability, to the extent that it involves very heavy financial burden with respect to the insurance problems of that liability, has not been the object of substantial discussion. The era of cosmic flight brought with it undoubtedly an untra-hazardous activity. As a result, men on earth would be deprived of an elementary means of defense, since it is impossible to foresee re-entry into the atmosphere of all parts of a spacecraft which may cause very substantial terrestrial damage. As a typical indication of concern for this problem, a member of the British Parliament has recently drawn attention to an example of damages to people and property in the case of a spacecraft falling on Westminster Abbey.

In the discussions leading to preparation of the text of the Convention the example of the Rome Convention on liability for damages caused by air traffic to third persons on the ground was frequently mentioned.[10] There, the principle of objective, rather than causal, liability was adopted. Since, in that Convention, objective liability was accepted as far back as 1952, there seemed no reason why not to adopt this principle also in the Convention on Liability in outer space.

An exception to this general rule of absolute (objective) liability was foreseen in article III of the Convention, which refers to the damages "caused elsewhere than on the surface of the earth to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State." In this case the liability will be causal based on the fault of the launching state. This reminds us of a

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[9]At the 15th Colloquium on the Law of Outer Space at the International Institute of Space Law, a special meeting was devoted to the problem of interpretation and application of the new convention on liability in outer space. At the meeting the following papers were presented: M. Bodenschatz, United Nations Liability Convention for Damages Caused by Space Objects; A. Cocca, The Concept of Full Compensation in the 1972 Convention; I. H. Ph. Diedericks-Verschoor, *supra,* note 7; G. Gal, Space Treaties and Space Technology-Questions of Interpretation; J. Harczeg, Some Problems of the Convention on Liability Arising from Space Objects; G. Meloni, Analyse de L'Interprétation de la Convention sur la Responsabilité Resultant des Activities Spatiales; F. Rusconi & P. Luzeane, Algunas Puntualisciones Acercà de la Interpretacion y Applicacion del Convenes Sabre la Responsibilidad Internacional; C. Paterman, Interpretation of Some Articles of the Liability Convention; D. Poulantzas, Some Remarks on the Convention on International Liability for Damages Caused by Space Objects; J. Rajski, Interpretation et Application de la Convention sur la Responsabilité pour Dommages Causés par des Objets Spatiaux; S. Williams, Further Remarks on Space Liability.

[10]Rome Convention Relating to Damage Caused by Foreign Aircraft to Third Parties on the Surface, signed October 7, 1952, entered into force February 4, 1958, I.C.A.O. Doc. 7364 (1952), 310 U.N.T.S. 181.

similar situation in air law, namely the Draft Convention on Aerial Collision [11] which was also based on the principle of casual liability.[12]

The Liability Convention also foresees in article IV-1(b) case of cf causal liability when the damages were done to a "space object of a third State or to persons or property on board that space object elsewhere than on the surface of the earth." In this case the liability to the third State will again be causal based on the fault of the launching States or of persons dependent upon those States.

The Convention allows for exoneration from liability under article VI in the well known case where the injured party, by his own fault, contributes to the damages.

It is important to note that whenever the Convention refers to States, the reference is also applicable to international intergovernmental organizations which deal with space activities.[13]

The determination of damages and compensation for those damages is based upon the principles of international law and the principles of justice and equity.[14] The reparation of damages must be such as to restore persons, States or international organizations to the situation which existed prior to the damage. Despite the fact that this seems to mean that only direct damages are compensable, and not indirect damages, it is quite possible that under appropriate circumstances another opinion may prevail.

Very lengthy discussions were necessary for a solution to the problem of limitation of responsibility. As a matter of fact, the Convention does not contain any limits of the amount of liability. This will probably be a decisive factor in the ratification process. Many nations will consider such an omission as financially implying too heavy a burden and, insofar as insurance is concerned, as having no chance of realization.

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11 This Draft was elaborated on by the Legal Committee of ICAO at its 15th Session in 1964. after many other drafts had been written by the Comité Internationale Technique d'Experts Juridiques Aériens (CITEJA) before the war. It was the opinion of many delegates that this draft was not precise enough. It has, therefore, not been presented for ratification to the member States. Report and Minutes of the Legal Commission, I.C.A.O. Doc. 8517, A15-LE/10 (1964).

12 The literature on aerial collisions is extensive; notice should be given to the following: M. Bodenschatz, Haftungsfragen Zusammenstoss von Luftfahrzeugen, Versicherungswirtschaft, 217 (1960); M. Bolla, L'Abordage Aérien, These 176 (1947); H. Drion, Zur Frage eines Internationalen Abkommens Betr. den Zusammenstoss in der Luft, ZLR 22-31 (1957); Fitzgerald. The Development of International Liability Rules Governing Aerial Collisions, Current Law and Social Problems 154-55 (1961); M. Juglart, Abordage Aérien, Revue Trimestrielle de Droit Commercial 662 (1960); R. Mankiewicz, The ICAO Draft on Aerial Collision, 30 J. Air. L. & Comm. 375-89 (1964); I. H. Ph. Rode-Verschoor, La Responsabilité dans L'Abordage entre les Aeronefs, RGA 274 (1955).

13 See Art. XXII of the U.N. Convention on International Liability for Damage Caused by Space Objects, as approved by the Legal Subcommittee of the U.N. Committee on Peaceful Uses of Outer Space on June 29, 1971, endorsed by that Committee in September, 1971, and adopted unanimously by Resolution 2777 (XXVI) of the U. N. General Assembly on November 29, 1971. For text, see 8 U. N. Monthly Chron. 19 (1972).

14 *Id* at Art. XII.

During the discussion of a definite text for the Convention some delegates declared themselves in favor of the establishment of an International Fund for the payment of damages caused by space craft. This proposition was not adopted, and the financial aspect of this problem continues to harbor great difficulties for the eventual ratification of the Convention.

As occurred with the Space Treaty of 1967 which produced many differing interpretations, such perplexities may also be the case with the Convention on Liability in Outer Space. It is well known that in preparation and later in practice there were many differences in the interpretation of article IV of the 1967 Space Treaty. During the six years after creation of that treaty many attempts were made to establish authoritative interpretations of its articles.[15] In view of the failure of those efforts the U.S.S.R. on June 4, 1971, sent directly to the Secretary General of the United Nations its proposed text for a new treaty on the legal status of the moon.[16] This is now on the agenda of the U. N. Committee on the Peaceful Uses of Outer Space, and it is likely that it will be adopted after a thorough discussion of its provisions.

Utilizing our experience with the Space Treaty of 1967, the International Institute of Space Law devoted, as already mentioned, a part of its Colloquium in Vienna, 1972, to the problems of interpretation and application of the new Convention on Liability in Outer Space. It is quite understandable that it was impossible in so short a time to reach conclusions regarding interpretation and application of the different articles of the new Convention. Therefore, it is normal that this problem should appear again on the agendas of many discussions of international lawyers and certainly on the next Colloquium of the International Institute of Space Law which will be held at Baku, U.S.S.R. in October of 1973.

Our experience with the works which were presented before the last Colloquium on the Law of Outer Space in Vienna, 1972, shows us that with regard to the security problem in outer space the situation is now much better. Many cases which could give rise to international conflicts in cosmic law are now neutralized by the detailed regulations of the Liability Convention.

It is true that the value of the Convention is a function of the number of its ratifications. Unfortunately, there have been so few ratifications that even article XXIV of the Convention, which provides that five ratifications are necessary for the validity of the Convention, has not yet been fulfilled.[17]

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[15] M. Smirnoff, La Nécessité d'un Traité sur le Statut Juridique de la Lune. Proc. 15th Colloquium on the Law of Outer SpaCe 6 (1973).

[16] At this point, it is appropriate to note the arguments of G. Zhukov on the position of the USSR delivered to the 14th Colloquium on the Law of Outer Space. G. Zhukov, The Legal Regime of the Moon: Problems and Prospects. Proc. 14th Colloquium on the Law of Outer Space 50 (1972).

[17] Editor's note: Convention on International Liability for Damage Caused by Space Objects, done at Washington, London, and Moscow March 29, 1972, entered into force September 1, 1972, ratified by the President May 18, 1973, 68 Dept. State Bull. 949 (1973).

Therefore, if the Liability Convention is to become an element for the betterment of relations in outer space, it is necessary to make all efforts that will speed its ratification. To this end, the meetings of lawyers all over the world who share this concern should be of greatest value.

THE INTELSAT DEFINITIVE ARRANGEMENTS+

*Richard Mizrack**

I. INTRODUCTION

In February of this year the definitive arrangements for the International Telecommunications Satellite Organization (INTELSAT) entered into force and thereby superseded and replaced the interim arrangements which had governed INTELSAT since its creation in August, 1964.[1] The entry into force of the new arrangements represents the culmination of one of the most complex multilateral negotiations ever undertaken, requiring three Plenipotentiary Conferences (1969, 1970 and 1971), three sessions of a Preparatory Committee between the first and second Conferences, and three sessions of an Intersessional Working Group before the final Conference.

The INTELSAT definitive arrangements are important not only to the continued development of the global commercial communications satellite system but also in the growth of international law and organization. In particular, they may provide some indication of what can be accomplished on an international level with respect to the practical application of modern technologies. It is the purpose of this paper to provide a description of the new organization, particularly the structural and financial aspects, in order to convey some understanding of how it will work in the future.

II. INTELSAT DEFINITIVE ARRANGEMENTS

A. Number and Type of Agreements Membership Requirements

The definitive arrangements consist of two separate but related international agreements: Agreement Relating to the International Telecommunications Satellite

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+This paper is an elaboration of the author's presentation before the Inter-American Bar Association's Committee on Space Communications on April 24, 1972 in Quito, Ecuador.

[1]Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System, August 20, 1964, 15 U.S.T. 1705, T.I.A.S. No. 5646 [hereinafter cited as Interim Agreement]. The interim arrangements consist of two separate but related agreements: Agreement Establishing Interim Arrangements for a Global Communications Satellite System (Interim Agreement) and a Special Agreement done in Washington on August 20, 1964, and entered into force August 20, 1964. The former is an intergovernmental agreement, the latter between the participants and investors in INTELSAT (the signatories to the Special Agreement). Provisions for settlement of disputes are contained in the Supplementary Agreement on Arbitration, done at Washington on June 4, 1965 and entered into force November 21, 1966. The name INTELSAT was adopted on October 28, 1965, and appears in copies of T.I.A.S. No. 5646 (reprinted in January, 1967). Article IX of the Interim Agreement contains the provisions respecting the negotiation of definitive arrangements. Article XV of the Interim Agreement provides that "This Agreement shall remain in effect until the entry into force of the definitive arrangement."

Organization "INTELSAT" with three Annexes, and Operating Agreement Relating to the International Telecommunications Satellite Organization "INTELSAT" with Annex.[2] Provisions for the settlement of disputes are contained in Annex C to the agreement. The Agreement is between governments and is the charter of INTELSAT, setting forth, *inter alia,* its structure, purposes and scope of activities. The Operating Agreement is between the actual participants and investors in INTELSAT (the Signatories) and contains their rights and obligations. As under the interim arrangements, the Signatories may be either the Governments Parties to the intergovernmental agreement or telecommunications entities, public or private, designated by those governments. The relationship between the Signatory and the Government designating it is a matter of domestic law.[3]

Membership in INTELSAT, under the interim arrangements, is open to the government of any State which is a member of the International Telecommunication Union (ITU); this is also a requirement of the definitive arrangements.[4]

B. Structure

The definitive arrangements establish a structure consisting of four organs: the Board of Governors, an executive organ responsible to the Board, an Assembly of Parties and a Meeting of Signatories.

1. The Board of Governors

A) Functions

The functions of the Board of Governors are almost identical to those of the Interim Committee, the governing body of INTELSAT under the interim arrangements. It is to have responsibility for the "design, development, construction, establishment, operation and maintenance of the INTELSAT space segment. . ." as well as other activities undertaken by INTELSAT.[5] Article X of the Agreement contains a lengthy list of most of the specific functions of the Board, some twenty-seven items in all. In short,

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[2]Agreement Relating to the International Telecommunications Satellite Organization "INTELSAT," August 20, 1971 [hereinafter cited as Agreement]; Operating Agreement Relating to the International Telecommunications Satellite Organization "INTELSAT," August 20, 1971 [hereinafter cited as Operating Agreement]; see T.I.A.S. No. 7532.

[3]Agreement, art. II b; Interim Agreement, art. II A.

[4]Interim Agreement, art XII a and b; Agreement, art. XIX a(1). Note that governments party to the Interim Agreement, whether then members of the ITU or not, may also adhere to the Agreement. Agreement, art. XIX a(11) and c. In addition the Agreement provides that "No party or its designated signatory shall be required to withdraw from INTELSAT as a direct result of any change in the status of that party with regard to the International Telecommunications Union." Agreement, art. XVI(n).

[5]Agreement, art. X(a). The other articles referred to include those dealing with the provision of facilities for specialized services. See Section IId *infra;* Agreement, art. IV(d)(e)(f) and VII(c)(iv). For the functions of the governing body of INTELSAT, the Interim Communications Satellite Committee, under the interim arrangements, see Interim Agreement, art. V.

the Board is the central organ of INTELSAT and the key to its proper operation and success.

B) Membership

Membership on the Board of Governors is available to any Signatory or group of Signatories with an investment share above a minimum to be set annually by the Meeting of Signatories, discussed in Section II, B. 4., *infra,* in order to maintain the number of Governors (as the members of the Board are called) eligible on this basis at an average of about twenty. The initial minimum investment share for the first Board of Governors is that equal to the share held by the thirteenth largest investor in INTELSAT at the date of entry into force of the definitive arrangements.[6] The Agreement also provides for one Governor representing any group of five or more Signatories from any of the five geographic regions defined by the ITU Plenipotentiary Conference at Montreaux in 1965, regardless of the total combined investment shares of the group; however, no more than two Governors from any one region nor more than five from all regions may be on the Board.[7]

Article IX(e) of the Agreement provides for continuity of all Governors until the next annual determination of investment shares, regardless of any change in the interval in the investment shares of the Signatories they represent. However, the Agreement provides that group representation shall cease immediately if any Signatory's withdrawal from the group would otherwise make the group ineligible for representation.[8]

Each Signatory represented on the Board has a voting participation equal to its percentage of utilization of the INTELSAT space segment for international public and certain specified types of domestic public traffic.[9] The Board is to endeavor to act unanimously. If it fails to do so, then decisions on substantive matters are to be taken by the affirmative support of at least four Governors who shall represent not less than two-thirds of the voting participation, or, in the alternative, by all the Governors with no more than three voting in the negative, regardless of the total number of votes. Decisions on procedural matters are to be taken by a simple majority of the Governors present and voting, each having one vote. No Governor may cast more than 40% of the votes

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[6]Agreement, art. IXa(1), (ii) and b. Representation on the Interim Committee is based solely on Investment Quota. Interim Agreement, *supra* note 5 at art. IV(b).

[7]Agreement, art. IXa(III) and d. The five regions are the Americas, Western Europe, East Europe/North Asia, Africa, and Asia/Australia.

[8]Agreement, art. IX(e). For the provisions under the interim arrangements with respect to a reduction in investment quota due to the entrance of a new signatory and with respect to the effect on a group of the withdrawal of a signatory see Interim Agreement, arts. IV(e) and XI(d).

[9]Agreement, art. IX(f). The type of domestic traffic to be included is that, approved by the meeting of signatories, and described in Sect. II. D., *infra.* The voting participation of a signatory might therefore be less than its investment share which is based upon total use of the INTELSAT space segment. See Sec. II. C., *infra.* A signatory's vote in the Interim Committee equals its investment quota. Interim Agreement, art. V(a).

represented on the Board; any excess is to be distributed to the other members equally.[10] The Chairman of the Board is to rule on whether a matter is substantive or procedural; he may be overruled by a two-thirds majority of the Governors present and voting, each having one vote.[11] These provisions are designed to "spread" powers among more members of the Board and dilute those of the largest users of the system.

2. Management Arrangements for an Executive Organ

The definitive arrangements provide for management by creating an executive organ[12] which, during a two step process over a period of about six years, is to assume total responsibility for all management functions for INTELSAT. That process is described below.[13]

As a matter of priority after the entry into force of the definitive arrangement the Board of Governors is to appoint a Secretary General to head the executive organ; he may be removed at any time by the Board for cause. The Secretary General is to be the legal representative of INTELSAT. He is responsible to the Board of Governors for those management functions of an administrative and financial nature; these are set forth in Annex A to the Agreement. The Secretary General's tenure terminates upon the assumption of office of the Director General, discussed below.

Management functions of a technical and operational nature are to be provided by the Communications Satellite Corporation, COMSAT, pursuant to a management services contract with INTELSAT which is to terminate six years after the entry into force of the definitive arrangements; the functions which Comsat is to perform are listed in Annex B to the Agreement. During the tenure of the Secretary General, COMSAT is to be responsible to and report directly to the Board of Governors. The Secretary General is to keep the Board informed "on the performance" of COMSAT and "to the extent practicable, . . . be present at or represented at and observe, but not participate in, major contract negotiations conducted" by COMSAT, on behalf of INTELSAT. However, he is not to be "interposed" between the Board and COMSAT as contractor.

By December 31, 1976, a Director General is to be appointed by the Board of Governors and confirmed by the Assembly of Parties to head the executive organ; he may be dismissed for cause by the Board of Governors. Upon assuming office he will be the chief executive and legal representative of INTELSAT, and be responsible to the Board of Governors for *all* management services including those performed by COMSAT (which is

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[10] Agreement art. IX(j) and (g)(iv). Decisions in the Interim Committee require a majority of the weighted vote; certain items require the votes of the largest investor plus 12.5 of the remaining votes. Interim Agreement, art. V(c).

[11] Agreement, art. IX(k).

[12] *Id.*, art. VI(a)(iv). Management services under the Interim Arrangements are provided by the Communications Satellite Corporation (COMSAT). Interim Agreement, art. VIII.

[13] Agreement, arts. XI and XII.

then to report to him and not the Board). In carrying out his functions, the Director General is to act in accordance with the policies and directives of the Board of Governors. Following the expiration of the management services contract with COMSAT, the Director General is to contract out, to one or more competent entities, technical and operational functions to the maximum extent practicable with due regard to cost and consistent with competence, effectiveness and efficiency.

3. The Assembly of Parties

Under the definitive arrangements, unlike the interim arrangements, governments in their sovereign capacities have an institutionalized role in a new organ, the Assembly of Parties, described as the "principal organ of INTELSAT".[14] The functions and powers of the Assembly of Parties are those of interest to sovereign entities and are designed so that there is minimum interference with the responsibilities of the Board of Governors. Thus, the Assembly "shall give consideration to those aspects of INTELSAT which are primarily of interest to the Parties as sovereign States" and can consider general policy and long-term objectives consistent with the principles and purposes and scope of activities of INTELSAT and within the limitations relating to the interrelationship of organs (described in Section II, B. 5., *infra*).

Its specified functions deal, *inter alia,* with amendment of the agreements, authorization of the providing of facilities by INTELSAT for specialized services, recommendations regarding separate satellite systems, the withdrawal of a Party, formal relationships with States or international organizations, complaints submitted by Parties, selection of legal experts for the settlement of disputes and confirmation of the appointment of the Director General.

Each representative has one vote. Decisions on substantive matters require the affirmative vote of two-thirds of the representatives present and voting while those on procedural matters require the affirmative vote of a simple majority of those present and voting.

The first ordinary meeting of the Assembly is to be convened by the Secretary General within one year of the entry into force of the definitive arrangements. Thereafter, ordinary meetings are scheduled once every two years unless otherwise decided by the Assembly. Provision is also made for extraordinary meetings.

4. The Meeting of Signatories

Unlike the interim arrangements, the definitive arrangements create an organ in which all Signatories are represented: the Meeting of Signatories.[15]

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[14] *Id.*, at art. VII.

[15] *Id.*, at art. VIII.

The functions of this organ are related to those aspects of INTELSAT which are of interest to the Signatories as investors and participants in the Organization. As with the Assembly of Parties it is subject to limitations on its power (see Section II, B. 5., below on interrelationship of organs). Its function and powers relate, *inter alia*, to future programs, annual financial statements, increases in INTELSAT's authorized capital ceiling, general rules on approval of earth stations, allotment of capacity on the system and rates for use of the system, withdrawal of a Signatory, complaints of Signatories or non-members, and the minimum investment share required for membership on the Board of Governors.

Each representative has one vote. Decesions on substantive matters require the affirmative vote of two-thirds of the representatives present and voting while those on procedural matters require the affirmative vote of a simple majority of those present and voting.

The Meeting of Signatories is to be convened by the Secretary General within nine months of the entry into force or the definitive arrangements; thereafter it is to meet annually. Extraordinary meetings may also be called.

5. Relationships Between Organs: Limitation on the Powers of Organs

The relationship between the Board of Governors, Assembly of Parties and Meeting of Signatories, is carefully delineated in the Agreement to achieve a careful balance between them. Article VI of the Agreement states that, unless specifically provided otherwise, "no organ shall make determinations or otherwise act in such a way as to alter, nullify, delay or in any other manner interfere with the exercise of a power or the discharge of a responsibility or a function attributed to another organ by this Agreement or the Operating Agreement." Subject to this limitation, each organ is to "take note of and give due and proper consideration to any resolution, recommendation or view made or expressed by another of these organs acting in the exercise of the responsibilities and functions attributed to it by this Agreement or the Operating Agreement." There is one difference, though perhaps meaningless, between the three organs in this regard: only the Board of Governors is required to explain to the other organs the action it takes with respect to resolutions, recommendations and views submitted to it by them and its reasons for such action.[16]

C. Financial Arrangements

The principle underlying the financial arrangements under the interim as well as the definitive arrangements is that a Signatory's investment in the system should be related to

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[16] *Id.*, at art. X(b).

its actual use of the system.[17]

Under the definitive arrangements each Signatory will have an investment share in INTELSAT equal to its percentage of all utilization of the INTELSAT space segment by all Signatories; however, no Signatory may have an investment share less than 0.05 percent. Investment shares will be adjusted annually to ensure that they reflect recent utilization. Signatories will be permitted to take an investment share smaller than they would receive on the basis of their use as long as others are willing to accept a corresponding increase in their investment shares.[18]

The Operating Agreement establishes a $500 million ceiling on the sum of the net capital contributions of the signatories and of the outstanding capital commitments of INTELSAT. The Meeting of Signatories may increase the ceiling from time to time; the Board of Governors may increase any current ceiling by up to 10 percent.[19] Each Signatory is to contribute to the capital requirements of INTELSAT in proportion to its investment share and receive capital repayment of capital and compensation for use of capital in proportion to its investment share.[20]

As under the interim arrangements, there will be a space segment utilization charge to cover the costs of operation and maintenance, the amortization of Signatories' investments, and compensation for use of capital. The rates of space segment utilization charges for each type of utilization are to be the same for Signatories and non-Signatories. The Board of Governors, in determining the rate for compensation for use of capital must fix the rate as close as possible to the cost of money in world markets but may add a factor which takes into account the risks associated with investment in INTELSAT.[21]

D. Scope of Activities

INTELSAT's purpose is defined as the continuation and carrying forward, on a definitive basis, of the design, development, construction, establishment, operation and maintenance of the space segment of the global commercial telecommunications satellite system.[22]

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[17] See generally Colino, INTELSAT: Doing Business in Outer Space, 6 Colum. J. Transnat'l. L. 17, 40-42 (1967), for a description of the financial provisions under the interim arrangements and their history. See also Interim Agreement, art. VI.

[18] Agreement, art. Vb; Operating Agreement, art. 6.

[19] Agreement, arts. VIIIb(iv) and X(a)(ix); Operating Agreement, art. 5.

[20] Agreement, art. V(c); Operating Agreement, arts. 4 and 8.

[21] Agreement, arts. V(d), VII(c)(v), VIII(b), (v), (c) and X(a)(iii); Operating Agreement, art. 8.

[22] Agreement, art. IIa. The purpose and scope of activities of INTELSAT under the interim arrangements is briefly stated to be the "design, development, construction, establishment, maintenance and operation of the space segment of the Global Commercial Communications Satellite System. . ." Interim Agreement, art. I. The definitive arrangements go into greater detail as to the types of services for which facilities may be provided; the scope of activities is described in this part. Agreement, arts. IV, V(e), VII(c)(iv) and X(a); Operating Agreement, art. 8(b).

INTELSAT's prime objective is the regulation of the space segment for all international public telecommunications[23] and those domestic public telecommunications between areas separated by areas not under the jurisdiction of the same state or by the high seas and those domestic public telecommunications, if the Meeting of Signatories so approves, between areas not linked by terrestrial wideband facilities and separated by natural barriers of such an exceptional nature that they impede the viable establishment of terrestrial wideband facilities between such areas. Other domestic public telecommunications may be provided on the INTELSAT space segment on a non-discriminatory basis, to the extent that the ability of INTELSAT to achieve its prime objective is not impaired.

On request, and under appropriate terms and conditions, and pursuant to authorization given by the Assembly of Parties "at the planning stage", specialized telecommunications services,[24] international or domestic, other than for military purposes, can be provided on the INTELSAT space segment if the regulation of public telecommunications is not unfavorably affected and the arrangements are otherwise acceptable from a technical and economic point of view. Such use is to be covered by contracts between INTELSAT and those requesting the service. Where such utilization will involve additional costs arising from "required modifications to the existing or planned INTELSAT space segment," authorization is to be sought from the Assembly of Parties as soon as "the Board of Governors is in a position to advise the Assembly of Parties in detail regarding the estimated cost of the proposal, the benefits to be derived, the technical or other problems involved, and the probable effects on present or foreseeable INTELSAT services." Before making such authorization, the Assembly, in appropriate cases, must consult or ensure that there has been consultation by INTELSAT with the relevant U.N. specialized agency.

INTELSAT may also provide upon request and under appropriate terms and conditions satellites and associated facilities separate from the INTELSAT space segment (*i.e.* not financed or owned by INTELSAT) for specialized public telecommunications services, international and domestic, other than for military purposes, if the efficient and economic operation of the INTELSAT space segment is not unfavorably affected in any way. The same requirements as to coverage of the services by contracts, Assembly authorizations and consultation with the U.N. specialized agencies apply to separate systems. INTELSAT may itself finance and own such separate satellites upon the unanimous approval of all Signatories. INTELSAT may also provide separate facilities for

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23" 'Public telecommunications services' means fixed or mobile telecommunications services which can be provided by satellite and which are available for use by the public, such as telephony, telegraphy, telex, facsimile, data transmission, transmission of radio and television programs between approved earth stations having access to the INTELSAT space segment for further transmission to the public, and leased circuits for any of these purposes; but excluding those mobile services of a type not provided under the Interim Agreement and the Special Agreement prior to the opening for signature of this Agreement, which was provided through mobile stations operating directly to a satellite which is designed, in whole or in part, to provide services relating to the safety or flight control of aircraft or to aviation or maritime radio navigating." Agreement, article I(k).

24*Id.* art. I(1).

domestic and international public services.

E. Juridical Status

INTELSAT under the interim arrangements has no juridical personality separate from its members and could best be described as a partnership or joint venture. It follows the pattern in this respect of most cooperative agreements for the establishment of international communications facilities, of which the fifth transatlantic cable, the TET-5, is an excellent example. That agreement, between operating entities in the United States, Spain, Portugal and Italy (entered into with the approval of their respective governments), created no new juridical entity; the parties retain their separate juridical identities. Each party contributes to the capital and operating costs of the TAT-5 project in proportion to the number of circuits it is allocated and decisions are taken on the basis of a majority votes of the parties, each party having a weighted vote in proportion to its relative capital contribution. Maintenance and operation of the facility is provided by the parties—each one being responsible for a specific section. Each party is subject to its own country's legal requirements and practice.[25]

The definitive arrangements, on the other hand, establish an international organization with its own juridical personality. Article IV of the Agreement provides:

> (a) INTELSAT shall possess juridical personality. It shall enjoy the full capacity necessary for the exercise of its functions and the achievement of its purposes, including the capacity to:
>
> (i) conclude agreements with States or international organizations;
>
> (ii) contract;
>
> (iii) acquire and dispose of property; and
>
> (iv) be a party to legal proceedings.
>
> (b) Each Party shall take such action as is necessary within its jurisdiction for the purpose of making effective in terms of its own law the provisions of this article.

One of the consequences of this granting of separate legal personality is that INTELSAT itself owns the INTELSAT space segment. However, although INTELSAT has a separate juridical personality limited liability is not confered on the Signatories who remain liable

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25 See Transatlantic No. 5 and Mediterranean No. 1 Submarine Cable System, Construction and Maintenance Agreement, June 20, 1968. See also 9 Whiteman, Digest of Int. Law 879, 902-917 (1968). As to some of the reasons and significance of INTELSAT's lack of juridical personality under the interim arrangements, see S. H. Lay and H. Taubenfeld, The Law Relating to Activities of Man in Space, 127-29 (1970).

for all of INTELSAT's liabilities and obligations in proportion to their investment shares.[26]

III. SUMMARY AND CONCLUSIONS

Space limitations unfortunately do not permit description of other important provisions of the definitive arrangements, including those dealing with procurement, rights in inventions and technical data, and settlement of disputes. This paper has attempted to provide a description of only certain important aspects of INTELSAT under the definitive arrangements—the structure of the organization, its purposes and scope of authorized activities, financial arrangements and juridical status—in order to provide an understanding of how INTELSAT will look in the future.

The INTELSAT definitive arrangements have now taken their place among the more important international agreements; perhaps they shall prove to be an example for future negotiators in dealing with the application of advanced technologies on an international level.

26As to membership, see Agreement, art. V(a); and as to liability, see Operating Agreement, art. 18. For the significance as to ownership and liability under the interim arrangements, see Interim Agreement, art. III and H. S. Lay and H. Taubenfeld, *supra* note 25.

THE NEED FOR AN INTERNATIONAL AGREEMENT ON DIRECT BROADCASTING BY SATELLITES

*Dr. Jan Busak**

The development of human society and of international collaboration is connected, *inter alia,* with the rapid growth in literacy and education and with the remarkable development of various techniques of mass communication. Of great importance was the invention of radio, by which nearly everyone could be reached and which made possible to the general public reception of the human voice from abroad. To this have been added the techniques of television. This combination of visual and audio perception increases not only the effectiveness of mass communication, but also the possibility of great influence on the minds of men in comparison to other means of mass communications. Artificial earth satellites have removed obstacles arising from the nature of radio wave propagation. Through space and telecommunication techniques, everyone, wherever he may be, can receive directly broadcast radio and television programs coming from any other country. While the effect of other mass communications media, the press for example, can be stopped on the frontiers, radio waves break through; radio and television services can speak, almost without restriction, to listeners in all countries of the world.

In the interest of human society and of all nations, and in accordance with international law, these new space and telecommunications techniques should serve the purpose of improving international understanding and cooperation. They should encourage the peaceful coexistence of all nations. When broadcasting fulfills this mission, the frontiers of all countries will remain open to radio and television broadcasts.

Unfortunately, since the beginning of broadcasting, experience has shown that sometimes it is or could be misused to contrary purposes, to incite the population of other countries to acts incompatible with internal order, to incite them to war or to acts likely to lead to war, and to the general detriment of harmonious international relations. Such activity violates the sovereignty of nations and is totally incompatible with peaceful co-existence and the principles of international law.

For these reasons attention was and is given to the international aspects of the broadcast service, namely to propaganda and the protection of the sovereign rights of states. International agreements concerning this matter were concluded some decades ago, and the bibliography dedicated to these problems and to broadcast transmissions and propaganda made by these means of mass communication is extensive.

There are two principal aspects of broadcasting (radio and television), namely:

Technical questions which are, in general, common to all radio communications and which fall, in the field of international regulation, within the competence of the International Telecommunications Union; questions concerning programs (both desirable and eventually undesirable), as political and legal problems to be treated in the sphere of the United Nations.

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This paper, dedicated to direct broadcasting[1] by satellite, deals, in the first place, with agreements and decisions adopted in the sphere of the International Telecommunications Union. The principles underlying these agreements, representing the collective opinions of the member-countries of the Union, could help reach an understanding about a series of other important problems concerning direct-broadcast services by satellite which have been for several years among the items on the agenda of the United Nations Committee on the Peaceful Uses of Outer Space and of UNESCO. A draft convention on guiding principles for direct television service by satellite was submitted by the Soviet Union to the Twenty-seventh United Nations General Assembly and discussed there.[2] Thus this article deals, for the most part, with questions to be settled in the near future at the United Nations level.

I.

Technical Questions Regarding Satellite Broadcasting Service

The technical questions of space telecommunications have been treated by the International Telecommunications Union and by its different organs since 1959,[3] but the wide problems of the broadcasting service only were on the agenda of the World Administrative Radio Conference for Space Telecommunications held in Geneva in 1971. The majority of decisions adopted by that Conference are included in the 1971 partial revision of the 1959 Radio Regulations;[4] others appear in eight resolutions and fifteen Recommendations.[5] The most important decisions concerning broadcasting satellite service can be summed up as follows:

a) "Broadcasting satellite service" is defined as "a radiocommunication service in which signals transmitted or retransmitted through space are intended for direct reception by the general public."[6] The term "direct reception" encompasses both individual reception (reception by simple domestic installations) and community reception (recep-

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[1]The term "broadcasting," as used in this article, refers to both radio and television broadcasts. *Cf.* Radio Regulations, done at Geneva December 21, 1959, entered into force Oct. 23, 1961, 12 U.S.T. 2377, T.I.A.S. No. 4893.

[2]See the proposed Convention on Principles Governing the Use by States of Artificial Earth Satellites for Direct Television Broadcasting, U. N. Doc. A/AC.105/C.2/L.88 (1973).

[3]See, for instance, the Ninth, Tenth and Eleventh Reports by the International Telecommunications Union on Telecommunications and the Peaceful Uses of Outer Space (1970, 1971, 1972).

[4]Partial Revision of Radio Regulations and Final Protocol: Space Telecommunications, signed at Geneva July 17, 1971, entered into force Jan. 1, 1973, T.I.A.S. No. 7435 at 8-293.

[5]*Id.* at 294-339.

[6]*Id.* at Annex 1 (Art. I) §§84AP.1, 84APA, 84APB.

tion by receiving equipment intended for use by members of the general public in one location, or through a distribution system covering a limited area).[7]

b) For the broadcasting satellite service the following frequency bands shall be used:

620-790 MHz, on condition that frequency assignments may be made to television stations only and subject to agreement between the administrations concerned and those which may be affected by the transmissions;

2500-2690 MHz, on condition that the broadcasting satellite service is limited to domestic and regional systems for community reception and that such use is subject to agreement between the administrations concerned;

11.7-12.75 GHz, on condition that fixed and mobile broadcasting services on the earth shall not cause harmful interference to broadcasting satellite services operating in accordance with the decisions of the appropriate broadcasting planning conference;

41-43 GHz and 84-86 GHz (exclusive broadcasting satellite service bands).[8]

c) All technical means available shall be used to reduce, to the maximum extent practicable, the radiation of space stations in the broadcasting satellite service over the territory of other countries unless an agreement has been previously reached with such countries.[9] This rule is intended to protect the sovereign rights of countries which would not be disposed to agree to the direct reception of broadcasts by satellite. This rule can be considered as analagous with rules concerning the terrestrial broadcasting service on medium waves, long waves, and very short waves; the power of these stations must not be superior to the signal strength necessary to ensure a national service of good quality within the territory of the country.[10]

d) The Conference recognized the importance of making the best possible use of geostationary satellite orbits and the frequency bands allocated to the broadcasting satellite service.[11] For this reason, stations operating in this service must be set up and operated in accordance with multilateral agreements and associated plans adopted by special conferences in which all administrations concerned and administrations whose services are likely to be affected may participate. The Administrative Council of the International Telecommunications Union has been assigned the task of convening world conferences or regional conferences, as required, for the purpose of establishing the plans.

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7 *Id.*

8 *Id.* at Annex 3 (Art. 5).

9 *Id.* at Annex 5 (Art. 7), §428A.

10 Radio Regulations, *supra* note 1, Art. 7, §428.

11 Partial Revision of Radio Regulations, *supra* note 4, Res. Spa 2-2.

e) The preparation, elaboration, and approval of broadcasting satellite plans is a long-term project.[12] Therefore, the Conference of 1971 decided that a special coordination procedure shall be applied to all stations in broadcasting satellite service set up prior to the entry into force of plans regulating this service.[13] The purpose of this procedure is to coordinate the frequency needs of all interested countries before the notification and entry of frequency assignments in the Master International Frequency Register.[14]

The Resolution stresses that only the date of receipt of the notification by the International Frequency Registration Board (I.F.R.B.) shall be entered in the Master International Frequency Register and that such recording does not prejudice in any way, the decisions to be included in the agreements and plans elaborated and approved by the future planning conferences.[15]

f) Very important is Resolution Spa 2-1 relating to the use by all countries, with equal rights, of the frequency bands allocated to space radiocommunication service. The registration and use of frequency assignments should not provide any permanent priority for any country and should not create any obstacle to the establishment of space systems by other countries.[16]

As mentioned above, the majority of the decisions of the World Administrative Radio Conference for Space Telecommunications are included in the Radio Regulations; they are or will be ratified in the near future.[17] The new rules included in the Radio Regulations entered into effect on January 1, 1973. The obligatory nature of these rules, which have the character of an international agreement, for all members of the International Telecommunications Union, is, especially with regard to Article 15, paragraphs 1 and 2 of the International Telecommunications Convention, quite evident and indisputable.[18]

The international legal character of the resolutions adopted by the Conference that are not included in the Radio Regulations could be considered quite differently. The resolutions have, from the legal point of view, the character of recommendations addressed to the member countries; nevertheless, it seems necessary to take into account the fact that these resolutions were adopted unanimously (including the two space powers) and that their purpose is to protect the interests of all members of the

12 7 Telecommunications J. 476 (1972).

13 Partial Revision of Radio Regulations, *supra* note 4, Res. Spa 2-3.

14 *Id.* Res. Spa 2-3, §4.1 et seq.

15 *Id.* Res. Spa 2-3, §6-4.

16 *Id.* Res. Spa 2-1.

17 The Partial Revision of Radio Regulations, *supra* note 4, was ratified by the United States on July 14, 1972, T.I.A.S. No. 7435.

18 International Telecommunications Convention, done at Montreaux Nov. 12, 1965, entered into force May 29, 1967, [1967] 18 U.S.T. 575, T.I.A.S. No. 6267.

International Telecommunications Union. It is implied that the measures provided by the resolutions will be put into effect and that the planning conferences will include the principles concerning the broadcasting satellite service in agreements concluded by them. In this way the decisions of the planning conferences will have an obligatory character for all signatories. As an example, the Resolution of the U. N. General Assembly No. 1962/XVIII (1973) and its associated declaration should be mentioned, and contents of which appear now in the Treaty on Principles Governing the Activities of States in Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies. [19]

From the point of view of international law, especially of space law, and with regard to the future development of the broadcasting satellite service, it is important that the collectivity of the 143 member countries of the International Telecommunications Union come to an agreement with regard to the following principles:

a) All members have equal rights in the sphere of the broadcasting satellite service irrespective of the level of their space and telecommunications techniques and economic possibilities;

b) No country must have any priority or preferential rights to the use of the geostationary orbit and the frequency bands allocated to the broadcasting-satellite service;

c) The sovereignty of each country must be protected and, therefore, radiation of broadcasting statellite signals over its territory is not allowed unless an agreement has been previously reached with such country.

Finally, an important rule included in the Radio Regulations since 1959 should be mentioned according to which the establishment and operation of broadcasting stations (including television transmitters) on board ships and aircraft outside the national territory of any country is prohibited.[20] This rule is intended to respect the sovereignty of coastal countries.[21]

II.

International Propaganda by Broadcasting

The transmission of broadcast programs, especially television programs, directly to

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[19] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies [hereinafter cited as Space Treaty], done at Washington, London and Moscow Jan. 27, 1967, entered into force Oct. 10, 1967, [1967] 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205.

[20] Radio Regulations, *supra* note 1, Art. 7, §422.

[21] For a text of the European Agreement for the Prevention of Broadcasts Transmitted from Stations Outside National Territories (Jan. 29, 1965), see 14 Int'l. & Comp. L. Q. 434 (1965).

home receivers is a very promising use of outer space for the benefit of mankind. This would promote better relations among peoples, encourage the exchange of cultural values, and raise the educational level of the population of different countries. However, this new technology could also raise serious legal problems relating to the need to ensure that the new space techniques serve only the maintenance of peace and friendship among peoples. Simultaneously it is necessary to protect state sovereignty from any external intervention and to prevent the conversion of the broadcasting satellite service into a source of conflicts and of aggravation of international relations. Broadcasting service by satellites must not become an instrument of propaganda inconsistent with the aims of the Charter of the United Nations.

International propaganda is addressed to peoples at large, or to regional, national, racial, religious, or professional groups. There is no objection to propaganda when its aims are the mutual understanding and peaceful co-existence of all peoples and countries, but propaganda is sometimes considered an instrument of policy—together with diplomacy, economics, and armed forces—against the interest of other states and their sovereignty. In this case, national sovereignty and the idea of the community of sovereign states, is inconsistent with international propaganda.[22]

Analyzing international propaganda, J. B. Whitton considers war-mongering propaganda, subversive propaganda, and defamatory propaganda to be dangerous. He states that ". . . we should now hold for an urgent need the disarmament of propaganda".[23]

With radio waves penetrating without any obstacle the frontiers of states, broadcasting has become one of the most important tools of international propaganda.

Conscious of the significance of this fact, the resolutions of the International Broadcasting Union of March 25 and July 6, 1926, claimed ". . . to eliminate broadcasting prejudicial to good international relations. . ." and requested that ". . . national transmissions should not contain, in the political, religious, economic, intellectual, and artistic field, any attack on the spirit of co-operation and international good will . . . ."[24]

The first step in international regulation of broadcasting transmissions on a multilateral basis was the Convention Concerning the Use of Broadcasting in the Cause of Peace, signed on September 23, 1936, under the League of Nations' auspices.[25] In articles 1-3 there are defined broadcasting transmissions which are dangerous to peaceful international co-existence and are, for this reason, forbidden; Articles 4 and 5 deal with recommended transmission, intended to promote international understanding and good

[22]L. Martin, International Propaganda 16-17 (1958).

[23]J. Whitton and A. Larson, Propaganda Towards Disarmament in the War of Words 1, 2, 10, 11, chs. III, IV, V and VI (1964).

[24]See L. Martin, International Propaganda 16-17 (1958).

[25]Convention Concerning the Use of Broadcasting in the Cause of Peace, signed at Geneva Sept. 23, 1936, entered into force April 2, 1938, 185 L.N.T.S. 301 (1938).

will. The Convention still binds thirty contracting parties (five of them by accession or succession during 1966-1969) and, therefore, it can be listed above under the heading of treaties as a source of law on this topic.[26]

In the Western Hemisphere, analogous ideas have been expressed, especially in Article 7 of the South American Regional Agreement on Radiocommunications concluded at Buenos Aires, on April 10, 1935, and later in Article 2 of the new South American Regional Agreement on Radiocommunications signed on June 6, 1937, revised at Santiago on January 17, 1940.[27]

After World War II the United Nations Charter became the principal basis for regulating relations between the states and protecting their equal rights and sovereignty. Under the Preamble to the United Nations Charter, the member states are pledged to practice tolerance and live together in peace with one another as good neighbors. The purpose of the United Nations is to maintain international peace and to develop friendly relations among nations, based on respect for the principles of equal rights and self-determination of peoples. According to Article 2 of the Charter "members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State." The Charter itself contains no rule concerning international propaganda, but considering the possibility of disruption of peaceful relations by illegal propaganda, it may be concluded that membership in the United Nations and the obligation to live together in peace as good neighbors would be violated by efforts, through propaganda, to harm the peaceful co-existence of states. This principle was confirmed by decisions of the competent organs of the United Nations.

Some of these decisions concern the need for peaceful and friendly international co-operation and good understanding in the field of economics, culture, science, technology and communications according to the letter and the spirit of the United Nations Charter.[28] There are also other resolutions dealing with the inadmissability of intervention, direct or indirect, in the domestic affairs of states and with the protection of their independence and sovereignty.[29] There is no doubt that broadcasting transmissions interfering with the internal affairs of other states should be considered as a form of indirect intervention.

26See 9 U. N. GAOR 841 (1971); Multilateral Treaties in Respect of which the Secretary-General Performs Depositary Functions. List of Signatures, Ratifications and Accessions as of Dec. 31, 1971, 22-23 (1971).

27Inter-American Radio Agreement, signed at Santiago Jan. 26, 1940, entered into force Feb. 25, 1942, 55 Stat. 1482, E.A.S. 231. The Santiago Agreement was replaced by the Inter-American Radio Agreement, done at Washington July 9, 1949, entered into force April 13, 1952, 3 U.S.T. 3064, T.I.A.S. No. 2489, 168 U.N.T.S. 143. See also VII M. Hudson, International Legislation 47-56, 767-99 (1960); S. Krylov, Mezdunaradno-pravovoe Reglurovanie Radiosvsjazi i Radiovescania 318-21 (1950); L. Martin, *supra* note 22 at 82.

28See, *e.g.*, G. A. Res. 123/XII (1957) and G. A. Res. 1301/XIII (1958).

29See, *e.g.*, G. A. Res. 2131/XX (1965) and G. A. Res. 2160/XXI (1966).

Also important is the declaration of principles of international law concerning friendly relations and cooperation among states in accordinace with the Charter of the United Nations adopted by the General Assembly on October 24, 1970.[30]

These resolutions do not expressly mention propaganda; nonetheless broadcast transmissions which do not follow the recommendations of the United Nations General Assembly in the form of resolutions or declarations should be considered contrary to the aims and goals of the United Nations Charter.

Besides the above-mentioned resolutions, from which the prohibition of illegal propaganda could be reduced indirectly, there are other resolutions directly concerning the inadmissibility of propaganda contradictory to the principles of international law. The most important is Resolution 110/II (1947) of the United Nations General Assembly on the measures to be taken against propaganda and the incitors of a new war.[31] Its paragraph 1 concerning the prohibition of war-mongering propaganda is mentioned in the Preamble to the Treaty of Principles Governing the Activities of States in Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies.[32]

The second very important resolution is Resolution 1904/XVIII (1973) proclaiming the declaration of the elimination of all forms of racial discrimination. Its Article 9 condemns "all propaganda. . .based on ideas. . .of the superiority of one race or group of persons of one color or ethnic origin with a view to justifying or promoting racial discrimination. . .". This principle has been included in Article 4 of the International Convention on the Elimination of All Forms of Racial Discrimination, opened for signature on March 7, 1966.[33]

Even the Resolution of the General Assembly of the United Nations on freedom of information and interference with radio signals inviting the member states to refrain from jamming the broadcasting transmissions from foreign countries as contrary to the principles of freedom of information, invites in paragraph 4 all governments "to refrain from radio broadcasting that would mean unfair attacks or slanders against peoples anywhere and in so doing to conform to ethical conduct in the interest of world peace by reporting facts truly and objectively."[34] Simply stated, this resolution condemns both jamming and subversive or defamatory propaganda.

Resolutions of international organizations including the United Nations have no

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30G. A. Res. 2625/XXV (1970); 25 U. N. GAOR Supp. 20, U. N. Doc. A/8028 (1970).

31This Resolution was reaffirmed by G. A. Res. 381/V (1950).

32Space Treaty, *supra* note 19.

33International Convention on the Elimination of all Forms of Racial Discrimination, done at New York December 21, 1965, entered into force Jan. 4, 1969, 25 U. N. GAOR Supp. 20, U. N. Doc. A/8028 (1970); *cf.* G. A. Res. 2106/XX (1965).

34G. A. Res. 424/V (1950).

binding force on states as do treaties. Rather, they are recommendations addressed to member states. However, they show a pattern of desire and will on the part of member states to lay down general principles in order to make subsequent work easier, especially codification that aims at the obligatory character of those principles in the form of treaties, conventions, etc. In this way the prohibition of propaganda regarding racial discrimination[35] has become, two years later, obligatory with the conclusion of the International Convention on the Elimination of All Forms of Racial Discrimination.[36] In the same way, having been introduced in the Preamble to the Space Treaty of 1967, paragraph 1 of Resolution 110/II (1947) condemning war-mongering propaganda now has binding force.

Analyzing the existing policy of the United Nations we can see that only some activities in the field of propaganda including propaganda by broadcasting were declared *verbis expressis* as prohibited and that for just this reason there is no doubt about the inconsistency of such propaganda with international law and about its illegality. However, this does not mean that other transmissions, whose contents—even though not expressly declared to be illegal propaganda—do not correspond to the letter and the spirit of the United Nations Charter and the principles of international law, should be considered permissible. Moreover, the illegality of propaganda by broadcast transmission—just as by other means of mass communications—must be judged not only with regard to the content and wording, but also with regard to the purpose, apparent or hidden, of transmissions, especially if such transmissions could produce breaches in international friendship and peaceful co-existence.

III.

Some Reasons for Concluding a Special Convention on Broadcasting-Satellite Transmissions

As mentioned above, there are some international documents intended to limit international propaganda, including propaganda by broadcasting, that is not in line with international law, namely with principles of peaceful co-existence of states and friendly relations among them. However, this international legal regulation cannot be considered as uniform and complete. Only the strict prohibition of war-mongering propaganda and of racial propaganda has taken the form of an international treaty with binding force; the prohibition of other kinds of propaganda is found directly, or rather indirectly, in other documents of the United Nations without obligatory character. In each case, propaganda violating the fundamental principles of the Charter should be considered, from the point of view of international law, as illegal and therefore prohibited. The Geneva International Convention Concerning the Use of Broadcasting in the Casue of Peace[37] deals generally

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[35]G. A. Res. 1904/XVII (1972).

[36]International Convention on the Elimination of All Forms of Racial Discrimination, *supra* note 33.

with broadcasting transmissions, prohibited and recommended, and does not concern television directly; the number of contracting parties does not exceed one-fifth of the nations in the world.

Moreover, after World War II in some countries, special broadcast agencies were established in order to achieve better conditions for launching propaganda transmissions in third countries.[38]

International propaganda using broadcasting and television transmitters is very effective, and it is feared that space and telecommunications technology could extend propaganda into outer space. In this way broadcasting services by satellites, including television, could become sources for aggravation of international relations and conflicts.

The efforts of the United Nations aim to avoid the rise of dangerous situations in the new domains of human activity, *e.g.* in the exploration of Antarctica,[39] and in the exploration and use of the deep sea bottom.[40] The legal regime applied in these domains is based on the recognition that, in the interest of mankind, these domains should be used exclusively for peaceful purposes and should not become the scene or object of international discord. The principle of disarmament is applied to these domains. In conformity with the Treaty on Principles Governing the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, the same regime entered into force for outer space. For these reasons, it is necessary to follow this policy to ensure that the broadcasting satellite service will fulfill its peaceful and cultural mission without violating the sovereignty of any state or other principles of international law.

The principle of freedom of information is often mentioned as a principle that ought to govern broadcasting transmissions; therefore, any limitation concerning the contents of transmissions should be considered as a grave violation. However, it must be taken into account that the restriction on broadcast propaganda has a legal basis introduced in conventions or, at least, in other documents of international character which are generally recognized. On the other hand, freedom of information has already been for two decades on the agenda of the United Nations and, up to the present time, no general convention on this matter has been elaborated. Moreover, the course of discussion

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[37]International Convention Concerning the Use of Broadcasting in the Cause of Peace, *supra* note 25.

[38]L. Martin, International Propaganda 21 et seq. (1958); J. Whitton and A. Larson, Propaganda Towards Disarmament in the War of Words 47-52 (1964); Internationals Handbuch fur Rundfunk und Fernsehen C-146-142 (1972); G. Krause-Ablass, Zur Rechtslage von Radio Free Europe, Rundfunk und Fernsehen 20-27 (1971).

[39]The Antqrctic Treaty, signed at Washington Dec. 1, 1959, entered into force June 23, 1961, 12 U.S.T. 794, T.I.A.S. No. 4780, 402 U.N.T.S. 71.

[40]Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil Thereof, done at Washington, London and Moscow Feb. 11, 1971, entered into force May 18, 1972, T.I.A.S. No. 7337.

in the United Nations organs does not show that freedom of information should be absolute or predominant over the state sovereignty.

There are also practical examples just chosen from international agreements relating, *inter alia,* to the flow of information. In conformity with articles 3 and 29 of the Tokyo postal convention of 1969,[41] the member states of the Universal Postal Union are authorized to suspend international postal service and to prohibit carriage into and from their territory of matter defined by their internal law. Similarly, articles 32 and 33 of the Montreaux International Telecommunications Convention of 1965[42] permit suspension of international telecommunications services, which include, of course, radiocommunications, and permit stopping information via telecommunications that is dangerous to the security of a member state or contrary to their laws, public order or decency. Both conventions fully respect the sovereign rights of the contracting states in the sphere of information. We should also mention article 35(a) of the Chicago Convention on International Civil Aviation of 1944,[43] recognizing the right of contracting parties to regulate or to prohibit, for reasons of public order and safety, the carriage into or above their territory of certain articles.

All of the above-mentioned demonstrates that the principle of sovereignty of states is the predominant rule in the sphere of information and that solutions adopted for the broadcasting-satellite service in order for it to become the most effective mass communication should be based, first of all, on the principle of mutual respect of sovereignty. On this principle is based the Draft Convention on Principles Governing the Use by States of Artificial Earth Satellites for Direct Television Broadcasting, submitted to the XXVIIth General Assembly of the United Nations by the Soviet Union in 1972.[44] After discussion in the First Committee and in the plenary meeting, the General Assembly adopted—by a vote of 102 for, 1 against (USA), and 7 abstentions—Resolution 2915/XXVII (1973) for the preparation of an international convention on principles governing the use by states of artificial earth satellites for direct television broadcasting. Resolution 2917/XXVII (1973), on the same matter, was adopted by a vote of 65 for, 9 against (including USSR and Czechoslovakia), and 12 abstentions.[45]

Paragraph 1 of another resolution, namely, Resolution 2916/XXVII (1973), states that it is necessary to elaborate the principles governing the broadcasting-service by satellites in regard to the conclusion of an international convention on this matter as the

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41See Additional Protocol to the Constitution of the Universal Postal Union of July 10, 1964, done at Tokyo Nov. 14, 1969, entered into force July 1, 1971, 22 U.S.T. 1056, T.I.A.S. No. 7150.

42International Telecommunications Convention, *supra* note 18.

43Convention on International Civil Aviation, done at Chicago Dec. 7, 1944, entered into force April 4, 1947, 61 Stat. 1180, T.I.A.S. No. 1591, 15 U.N.T.S. 295.

44Convention on Principles Governing the Use by States of Artificial Earth Satellites for Direct Broadcasting, *supra* note 2.

45See 12 U. N. Monthly Chron. 37-41 (1972).

final aim. In this way, the resolution gives a clear answer to the question of whether or not there is a need for a special international agreement. In paragraph 2 of the same resolution, the Committee on the Peaceful Uses of Outer Space has been requested to elaborate the fundamental rules.

Also, the preamble to the same Resolution, states some principles that should be taken into consideration:

a) Direct broadcasting service by satellite shall serve the purpose of development of friendly relations and mutual understanding among all states, and of the increase in exchange of information and cultural values;

b) The new space technology must not become a source of international conflicts and aggravation of international relations;

c) The activities of states in the sphere of broadcasting-service by satellite shall be based on the principles of mutual respect of state sovereignty, of non-interference with the internal affairs of other states, of equal rights, and of cooperation and mutual benefit.

The last paragraph of the preamble refers to serious problems connected with the necessary balance between strict respect for state sovereignty and freedom of information. This matter is treated also in Resolution 2917/XXVII (1972), referring to the work done on the Draft Convention on Freedom of Information and to the deliberations in the different bodies of the United Nations.

Also the Declaration on Guiding Principles on the Use of Satellite Broadcasting for the Free Flow of Information, the Spread of Education and Greater Cultural Exchange, which was adopted by the General Conference of UNESCO at its XVIIth session held at Paris in 1972,[46] proclaims *inter alia* the same fundamental principles as the United Nations General Assembly's Resolution 2916/XVII (1972). It, however, is not a binding legal instrument.

During the discussions in the General Assembly and the General Conference of UNESCO two different opinions were stated. In both organizations, the majority of member states seemed to be in favor of strict protection of state sovereignty, including the consent of the state for whose territory the broadcasting-satellite service is intended. without denying the principle of freedom of information. Other states preferred the principle of freedom of information as the fundamental one. The position of many states may be influenced by the fact that they have no capability to launch their own broadcasting satellites and that they will be obliged to use broadcasting-satellite services operated by a small number of other countries owning communications satellites. Let us hope that, in the interest of all peoples, this difference of opinion can be resolved in the near future when all states have the good will to do so.

46U. N. Doc. A/AC.105/104 (1972); Courrier de l'UNESCO (French ed.) 21-23 (Feb. 1973). The Declaration was adopted by a vote of 55 to 7, including the U.S.A., and 22 abstentions.

IV.

Remarks on the Fundamental Principles Governing the Broadcasting Service by Satellites

At the present time only two space powers and a few other states (or groups of them) have or will have the technical and economic means for launching and operating broadcasting satellites. Other states, if they want to participate in the broadcasting-satellite service, will be obligated to use satellites of other countries. It is possible that some of them could later require their own. For these reasons, all countries desire a guarantee of equal rights in the sphere of broadcasting-satellite services; this equality has two aspects:

1) No monopoly by any state should exist in the sphere of launching and operating communications satelites.[47]

2) The right to and possibility of reception by direct transmission coming from satellites of any other states should exist without any discrimination. (No state may refuse to help another country by direct transmission, if requested.)

As mentioned above, sovereignty of all states should be fully respected as the fundamental principle. This principle should manifest itself mainly along the following lines:

a) Direct broadcasting by satellites to foreign countries should be subject to the express consent of the latter. It is noteworthy that technical measures are provided in Article 7 of the Radio Regulations, revised in 1971,[48] in order to reduce to the maximum extent practicable the radiation over the territory of other states, unless a previous agreement has been reached;

b) States to which direct broadcasting transmissions are addressed, with their consent, should have influence upon the contents of these transmissions;

c) Transmissions of a commercial and public nature for direct reception in earth are not allowed when the receiving state does not agree to it;

d) Broadcasting transmissions must not interfere in the internal or other affairs of the receiving state;

e) The receiving state should be entitled to withdraw its consent at any time;

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47 See also Partial Revision of Radio Regulations, *supra* note 4.

48 Partial Revision of Radio Regulations, *supra* note 4, Annex 5 (Art. 7).

f) Conflicts between the principle of freedom of information and the principle of state sovereignty should be resolved in favor of the latter.

The purpose of direct broadcasting services seems to be clear. Broadcast transmissions should be conducive to the promotion of friendly international relations and peaceful co-existence of all states to the increase of mutual understanding and better knowledge of peoples, to the advancement of the educational level of populations and to the development of culture and the increase of exchanges of cultural values. In other words, the new space technology should serve exclusively the interest and welfare of mankind.

The development of space technology, like many other developments in technology, is not free from negative side effects. To demonstrate this fact one need only mention propaganda disseminated by some broadcasting stations and notice the measures carried out by the General Assembly of the United Nations (*e.g.*, prohibition of warmongering propaganda, racial propaganda, etc.). For this very reason it becomes necessary to define *verbis expressis* what kinds of broadcasting transmissions are not in accord with the principles of international law and with the peaceful uses of outer space. As contrary to international law and the interests of mankind, in the following cases satellite transmissions should be considered and disallowed when they are:

1) dangerous to the maintenance of international peace and security (*e.g.*, warmongering), or

2) interfering in any way with the internal affairs of other states (*e.g.*, subversive propaganda), or

3) directed against fundamental human rights and freedoms (*e.g.*, propaganda based on distinctions as to race, sex, language, or religion), or

4) intended to disseminate information tending to intimidate peoples or to encourage immorality and use of narcotics, or

5) intended to disseminate deliberately defamatory and false news for peoples of foreign countries.

Satellite broadcast transmissions to foreign countries, when contrary to all of the afore-mentioned principles, just as transmissions radiated over the territory of foreign countries without the previous consent of the latter, should be prohibited and considered illegal.

It should also be noted that national penal systems consider the above activities to be punishable. It would be very strange not to prohibit transmissions to foreign countries,

the content of which forms the factual substance of criminal acts defined by the municipal laws of the latter.[49]

Principles governing the responsibility for the activities of states in outer space were incorporated in Article 6 of the Space Treaty concluded in 1967,[50] according to which the contracting states are fully responsible for the space activities of both governmental and nongovernmental institutions. Article 22 of the International Telecommunications Convention[51] defines the responsibility of states in the field of telecommunications in a similar way. Moreover, in conformity with Article 18 of the Radio Regulations,[52] the control of nongovernmental bodies is strengthened by the fact that the establishment and operation of all transmitting stations require a special license delivered by the competent governmental authority.

Control and responsibility in the sphere of broadcasting services by satellite should be, in detail, organized as follows:

a) States owning and operating satellites for broadcasting to foreign countries should ensure that transmissions intended for the latter shall be strictly controlled by the state itself, and that the principles governing such transmissions shall be strictly observed; they should also be obliged to stop any transmissions contrary to these principles.

b) The receiving state should have the right to request that the principles set up by international agreements or other international documents be observed; it could also withdraw its consent when the transmitting state (the responsible state) does not ensure the strict observation of the agreed rules.

c) Controversies arising under the application of the agreement on principles governing the broadcasting satellite service should be settled by means of mutual consultations according to Article IX of the Space Treaty concluded in 1967, by diplomatic channels, or by any other means (*e.g.*, by procedure of arbitration) which have been generally agreed upon between the states concerned. Controversies could also be submitted to the International Court of Justice if each party is a member and when no party is opposed to such procedure.

Finally, the technical and administrative regulations adopted by the International Telecommunications Union should not be affected by the elaboration of the declaration or international agreement on principles governing broadcasting-satellite transmissions.

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[49] L. Martin, International Propaganda 109-63 (1958).

[50] Space Treaty, *supra* note 19.

[51] International Telecommunications Convention, *supra* note 18.

[52] Radio Regulations, *supra* note 1.

Conclusions

The new space and telecommunications technology should be used, according to the principles governing the activities of states in exploration and use of outer space, only for peaceful purposes and in the interest of mankind. Therefore, it is necessary to suppress all that could interfere with the above principles. This rule should be applied also to broadcasting transmissions by satellites intended to be received directly by the general public on Earth. For this reason it is necessary to elaborate an international agreement intended to develop the fundamental principles of international law, including space law, in regard to the specific conditions of broadcasting-satellite services. In order to ensure the peaceful co-existence of all states and international co-operation in outer space with regard to direct broadcasting by satellites, such an agreement should confirm the equal rights and sovereignty of all states, define the purpose and aims of broadcasting transmissions by satellites and state what kinds of transmissions should not be allowed, and define the conditions of control, responsibility and settlement of controversies, etc. The elaboration of principles and of the convention itself is within the competence of the United Nations as expressed under Resolution 2916/XXVII (1972) and Resoltuion 2917/XXVII (1972).

I.

General Assembly Resolution 2915*

International co-operation
in the peaceful uses of outer space

The General Assembly,

Recalling its resolutions 2776 (XXVI), 2777 (XXVI), 2778 (XXVI) and 2779 (XXVI) of 29 November 1971,

Having considered the report of the Committee on the Peaceful Uses of Outer Space,

Reaffirming the common interest of mankind in furthering the exploration and use of outer space for peaceful purposes,

Recalling its resolution 1721 B (XVI) of 20 December 1961, in which it expressed the belief that the United Nations should provide a focal point for international co-operation in the peaceful exploration and use of outer space,

Believing that the benefits deriving from space exploration can be extended to States at all stages of economic and scientific development on an expanding basis if Member States conduct their space programmes increasingly with a view of promoting maximum international co-operation, including the widest possible exchange of information in this field,

Convinced of the need for increased international efforts, particularly through the United Nations, to promote and expand practical applications of space technology,

Reaffirming the importance of international co-operation in developing the rule of law in the peaceful exploration and use of outer space,

1. *Endorses* the report of the Committee on the Peaceful Uses of Outer Space;

2. *Invites* States which have not yet become parties to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, to give early consideration to ratifying or acceding to those agreements so that they may have the broadest possible effect;

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*Adopted unanimously on Nov. 9, 1972. (Footnotes are omitted.)

3. *Expresses its satisfaction* at the recent entry into force of the Convention on International Liability for Damage Caused by Space Objects and invites States that have not yet become parties to it to give early consideration to ratifying or acceding to it so that it may have the broadest possible effect;

4. *Notes* that the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space has achieved significant progress in approving a substantial part of the draft treaty relating to the Moon, observing at the same time that some issues are still unresolved;

5. *Notes further* that the Legal Sub-Committee has made notable progress in preparing the draft convention on registration of objects launched into outer space, observing at the same time that some issues are still unresolved;

6. *Agrees* that the Legal Sub-Committee should at its next session pursue, as a matter of priority, its work on the draft treaty relating to the Moon and the draft convention on registration of objects launched into outer space;

7. *Notes* that, because of lack of time, the Legal Sub-Committee was not able to consider in any detail the remaining matters on its agenda, as mentioned in paragraph 19 of the report of the Committee on the Peaceful Uses of Outer Space, and expresses the hope that early consideration will be given to those matters;

8. *Welcomes* efforts of Member States to keep the Committee on the Peaceful Uses of Outer Space fully informed of their space activities and invites all Member States to do so;

9. *Welcomes also* the continuing progress achieved by the Committee on the Peaceful Uses of Outer Space and the Secretary-General, through the Expert on Space Applications, in their efforts to develop the United Nations programme on space applications into a significant means of promoting international co-operation in this field and commends to the attention of Member States, the specialized agencies and interested United Nations bodies the programme contained in the report of the Committee's Scientific and Technical Sub-Committee on the work of its ninth session;

10. *Endorses* the United Nations programme on space applications for 1973 and the guidelines for the programme for 1974 and recommends the continuing development of the programme, taking especially into account the needs of the developing countries;

11. *Notes with appreciation* that several Member States have offered educational and training facilities, under United Nations sponsorship, in the practical application of space technology and draws the attention of Member States, particularly the developing countries, to these opportunities as outlined in paragraphs 28 to 32 of the report of the Scientific and Technical Sub-Committee;

12. *Notes with appreciation* that data from experiments testing the feasibility of remote sensing of the earth from space platforms will soon be made available to the Working Group on Remote Sensing of the Earth by Satellites;

13. *Welcomes* the fact that the Working Group on Remote Sensing of the Earth by Satellites plans to begin its substantive work in January 1973 and notes that the Worker Group has requested the Secretary-General to prepare in accordance with General Assembly resolution 2778 (XXVI) of 29 November 1971, a background paper assessing the documents and other data brought to its attention, including the data referred to in paragraph 12 above, and that it has set up a task force to assist the Secretary-General in this respect;

14. *Looks forward* to a comprehensive progress report on remote sensing to be submitted by the Committee on the Peaceful Uses of Outer Space;

15. *Takes note with gratification* of the consideration being devoted to the Committee on the Peaceful Uses of Outer Space to the potential of satellites and other space platforms in monitoring the human environment with a view to helping to achieve the objectives of the future environmental programmes of the United Nations;

16. *Welcomes* the efforts of a number of Member States to share with other interested Member States the practical benefits that may be derived from programmes in space technology;

17. *Welcomes* the further progress achieved in international co-operation among Member States in space research and exploration, including in particular the continuing exchange and analysis of lunar material on a broad international basis, experiments in earth resource surveying making use of the United States satellite ERTS-I and the agreement between the Union of Soviet Socialist Republics and the United States of America on the development of compatible rendezvous and docking systems for manned spacecraft with a view to developing joint flight and improved rescue capabilities;

18. *Notes* that the Committee on the Peaceful Uses of Outer Space has recommended that its Working Group on Direct Broadcast Satellites, in view of its interdisciplinary character and its co-ordinating functions, should be reconvened to study the substantive material concerning the subject-matter under its mandate that has become available since the Working Group's last session, in accordance with the relevant paragraphs of the Committee's report;

19. *Reiterates* the importance of the goal of making satellite communications available to States on a world-wide and non-discriminatory basis, as expressed in General Assembly resolution 1721 D (XVI) of 20 December 1961;

20. *Takes note* of the progress achieved in implementing agreements relating to space communications recently concluded among a number of States and reiterates the

desirability of keeping the United Nations currently informed concerning activities and developments in this field;

21. *Approves* continuing sponsorship by the United Nations of the Thumba Equatorial Rocket Launching Station in India and the CELPA Mar del Plata Station in Argentina, expresses its satisfaction at the work being carried out at these ranges in relation to the use of sounding rocket facilities for international co-operation and training in the peaceful and scientific exploration of outer space and recommends that Member States should continue to give consideration to the use of those facilities for space research activities;

22. *Welcomes* the announcement by Sweden that the ESRANGE-Kiruna range will also be made available for international co-operative projects;

23. *Notes* that, in accordance with General Assembly resolution 1721 B (XVI) of 20 December 1961, the Secretary-General continues to maintain a public registry of objects launched into orbit or beyond on the basis of information furnished by Member States;

24. *Notes with appreciation* that a number of the specialized agencies, in particular the World Meteorological Organization, the International Telecommunication Union, the United Nations Educational, Scientific and Cultural Organization and the Food and Agriculture Organization of the United Nations, have continued to take an active part in the United Nations programme for the promotion of international co-operation in the practical application of space technology, including the organization of technical panels;

25. *Takes note* of the programmes currently undertaken by the United Nations Educational, Scientific and Cultural Organization and the International Telecommunication Union in satellite broadcasting for the purpose of contributing to the advancement of education and training, including consideration by the United Nations Educational, Scientific and Cultural Organization of the draft Declaration of Guiding Principles on the Use of Satellite Broadcasting for the Free Flow of Information, the Spread of Education and Greater Cultural Exchange, and also notes the need to co-ordinate activities of the specialized agencies in this field with the Committee on the Peaceful Uses of Outer Space as set out in General Assembly resolution 2776 (XXVI) of 29 November 1971;

26. *Requests* the specialized agencies and the Interternational Atomic Energy Agency to continue, as appropriate, to provide the Committee on the Peaceful Uses of Outer Space with progress reports on their work relating to the peaceful uses of outer space and to examine and report to the Committee on the particular problems that may arise from the use of outer space in the fields within their compentence and that should, in their opinion, be brought to the attention of the Committee;

27. *Notes* that the Committee on the Peaceful Uses of Outer Space has agreed to grant observer status to the European Space Research Organization and the European

Launcher Development Organization and to invite them to participate in the Committee's work;

28. *Requests* the Committee on the Peaceful Uses of Outer Space to continue its work, as set out in the present resolution and in previous resolutions of the General Assembly, and to report to the Assembly at its twenty-eighth session.

II.

General Assembly Resolution 2916*

Preparation of an international convention on principles governing the use by States of artificial earth satellites for direct television broadcasting

The General Assembly,

Recalling its resolution 2222 (XXI) of 19 December 1966, in which it stressed the importance of international co-operation in the field of activities in the peaceful exploration and use of outer space and the importance of developing the rule of law in this new area of human endeavour,

Recalling further its resolution 2453 B (XXIII) of 20 December 1968, in which it stated that the benefits of space exploration can be extended to States at all stages of economic and scientific development,

Reaffirming the common interest of all mankind in furthering the peaceful exploration and use of outer space for the benefit of all States and for the development of friendly relations and mutual understanding among them,

Bearing in mind that direct television broadcasting should help to draw the peoples of the world closer together, to widen the exchange of information and cultural values and to enhance the educational level of people in various countries,

Considering at the same time that direct television broadcasting by means of satellites should take place under conditions in which this new form of space technology will serve only the lofty goals of peace and friendship among peoples,

Mindful of the need to prevent the conversion of direct television broadcasting into a source of international conflict and of aggravation of the relations among States and to protect the sovereignty of States from any external interference,

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*Draft resolution I, A/8864, as amended in plenary; adopted by the Assembly on Nov. 9, 1972 by a vote of 102 to 1 (U.S.), and 7 abstentions. (Footnotes are omitted.)

Noting the draft convention on principles governing the use by States of artificial earth satellites for direct television broadcasting, submitted to the General Assembly by the Union of Soviet Socialist Republics,

Desiring to further the elaboration of specific rules of international law governing the activities of States in this field on the basis of the Charter of the United Nations, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies and the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations,

Believing that the activity of States in the field of direct television broadcasting must be based on the principles of mutual respect for sovereignty, non-interference in domestic affiars, equality, co-operation and mutual benefit,

Considering at the same time that the introduction of direct television broadcasting by means of satellites could raise significant problems connected with the need to ensure the free flow of communications on a basis of strict respect for the sovereign rights of States,

1. *Considers* it necessary to elaborate principles governing the use by States of artificial earth satellites for direct television broadcasting with a view to concluding an international agreement or agreements;

2. *Requests* the Committee on the Peaceful Uses of Outer Space to undertake the elaboration of such principles as soon as possible;

3. *Requests* the Secretary-General to transmit to the Committee on the Peaceful Uses of Outer Space all documentation relating to the discussion, at the twenty-seventh session of the General Assembly, of the item entitled "Preparation of an interantional convention on principles governing the use by States of artificial earth satellites for direct television broadcasting".

III.

General Assembly Resolution 2917*

Preparation of international instruments or United Nations arrangements on principles governing the use by States of artificial earth satellites for direct television broadcasting

The General Assembly,

*Draft resolution II, A/8864; adopted by the Assembly on Nov. 9, 1972 by a vote of 65 to 9 (U.S.S.R.), with 32 absentions (U.S.) (Footnotes are omitted.)

Recalling its resolution 2448 (XXIII) of 19 December 1968, dealing with freedom of information, and the preamble of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, which stipulates that General Assembly resolution 110 (II) of 3 November 1947 is applicable to outer space,

Notes that the work done on the draft Convention on Freedom of Information and deliberations thereon in the General Assembly may be useful in the discussion and elaboration of international instruments or United Nations arrangements relative to direct television broadcasts.

IV.

UNESCO

Declaration of Guiding Principles on the Use of Satellite Broadcasting for the Free Flow of Information The Spread of Education and Greater Cultural Exchange*

The General Conference of the United Nations Educational, Scientific and Cultural Organization meeting in Paris at its seventeenth session in 1972,

Recognizing that the development of communication satellites capable of broadcasting programmes for community or individual reception establishes a new dimension in international communication,

Recalling that under its Constitution the purpose of Unesco is to contribute to peace and security by promoting collaboration among the nations through education, science and culture, and that, to realize this purpose, the Organization will collaborate in the work of advancing the mutual knowledge and understanding of peoples through all means of mass communication and to that end recommend such international agreements as may be necessary to promote the free flow of ideas by word and image,

Recalling that the Charter of the United Nations specifies, among the purposes and principles of the United Nations, the development of friendly relations among nations based on respect for the principle of equal rights, the non-interference in matters within the domestic jurisdiction of any State, the achievement of international co-operation and the respect for human rights and fundamental freedoms,

Bearing in mind that the Universal Declaration of Human Rights proclaims that everyone has the right to seek, receive and impart information and ideas through any media and regardless of frontiers, that everyone has the right to education and that everyone has the right freely to participate in the cultural life of the community, as well

*Taken from U.N. Doc. A/Ac.105/109/Corr. 1, Feb. 16, 1973.

as the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author,

Recalling the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (resolution 1962 (XVIII) of 13 December 1963), and the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, of 1967 (hereinafter referred to as the Outer Space Treaty),

Taking account of United Nations General Assembly resolution 110 (II) of 3 November 1947, condemning propaganda designed or likely to provoke or encourage any threat to the peace, breach of the peace or act of aggression, which resolution as stated in the preamble to the Outer Space Treaty is applicable to outer space; and the United Nations General Assembly resolution 1721 D (XVI) of 20 December 1961 declaring that communication by means of satellites should be available as soon as practicable on a global and non-discriminatory basis,

Bearing in mind the Declaration of the Principles of International Cultural Co-operation adopted by the General Conference of Unesco, at its fourteenth session,

Considering that radio frequencies are a limited natural resource belonging to all nations, that their use is regulated by the International Telecommunications Convention and its Radio Regulations and that the assignment of adequate frequencies is essential to the use of satellite broadcasting for education, science, culture and information,

Noting the United Nations General Assembly resolution 2733 (XXV) of 16 December 1970 recommending that Member States, regional and international organizations, including broadcasting associations, should promote and encourage international co-operation at regional and other levels in order to allow all participating parties to share in the establishment and operation of regional satellite broadcasting services,

Noting further that the same resolution invites Unesco to continue to promote the use of satellite broadcasting for the advancement of education and training, science and culture, and in consultation with appropriate intergovernmental and non-governmental organizations and broadcasting associations, to direct its efforts toward the solution of problems falling within its mandate,

Proclaims on the 15th day of November 1972, this Declaration of Guiding Principles on the Use of Satellite Broadcasting for the Free Flow of Information, the Spread of Education and Greater Cultural Exchange:

Article I

The use of Outer Space being governed by international law, the development of

satellite broadcasting shall be guided by the principles and rules of international law, in particular the Charter of the United Nations and the Outer Space Treaty.

Article II

1. Satellite broadcasting shall respect the sovereignty and equality of all States.

2. Satellite broadcasting shall be apolitical and conducted with due regard for the rights of individual persons and non-governmental entities, as recognized by States and international law.

Article III

1. The benefits of satellite broadcasting should be available to all countries without discrimination and regardless of their degree of development.

2. The use of satellites for broadcasting should be based on international co-operation, world-wide and regional, intergovernmental and professional.

Article IV

1. Satellite broadcasting provides a new means of disseminating knowledge and promoting better understanding among peoples.

2. The fulfilment of these potentialities requires that account be taken of the needs and rights of audiences, as well as the objectives of peace, friendship and co-operation between peoples, and of economic, social and cultural progress.

Article V

1. The objective of satellite broadcasting for the free flow of information is to ensure the widest possible dissemination, among the peoples of the world, of news of all countries, developed and developing alike.

2. Satellite broadcasting, making possible instantaneous world-wide dissemination of news, requires that every effort be made to ensure the factual accuracy of the information reaching the public. News broadcasts shall identify the body which assumes responsibility for the news programme as a whole, attributing where appropriate particular news items to their source.

Article VI

1. The objectives of satellite broadcasting for the spread of education are to accelerate the expansion of education, extend educational opportunities, improve the content of school curricula, further the training of educators, assist in the struggle against illiteracy, and help ensure life-long education.

2. Each country has the right to decide on the content of the educational programmes broadcast by satellite to its people and, in cases where such programmes are produced in co-operation with other countries, to take part in their planning and production, on a free and equal footing.

Article VII

1. The objective of satellite broadcasting for the promotion of cultural exchange is to foster greater contact and mutual understanding between peoples by permitting audiences to enjoy, on an unprecedented scale, programmes on each other's social and cultural life including artistic performances and sporting and other events.

2. Cultural programmes, while promoting the enrichment of all cultures, should respect the distinctive character, the value and the dignity of each, and the right of all countries and peoples to preserve their cultures as part of the common heritage of mankind.

Article VIII

Broadcasters and their national, regional and international associations should be encouraged to co-operate in the production and exchange of programmes and in all other aspects of satellite broadcasting including the training of technical and programme personnel.

Article IX

1. In order to further the objectives set out in the preceding articles, it is necessary that States, taking into account the principle of freedom of information, reach or promote prior agreements concerning direct satellite broadcasting to the population of countries other than the country of origin of the transmission.

2. With respect to commercial advertising, its transmission shall be subject to specific agreement between the originating and receiving countries.

Article X

In the preparation of programmes for direct broadcasting to other countries, account shall be taken of differences in the national laws of the countries of reception.

Article XI

The principles of this Declaration shall be applied with due regard for human rights and fundamental freedoms.

V.

Draft Convention on Registration of Objects Launched into Outer Space*

Draft articles approved by Working Group II of the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space

Preamble

The States parties to this Convention,

Recognizing the common interest of all mankind in furthering the exploration and use of outer space for peaceful purposes,

Recalling that the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, affirms that States shall bear international responsibility for their national activities in outer space and refers to the State on whose registry an object launched into outer space is carried,

Recalling also that the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space provides that a launching authority shall, upon request, furnish identifying data prior to the return of an object it has launched into outer space which has come into the possession of another State party,

Recalling further that the Convention on International Liability for Damage Caused by Space Objects elaborates international rules and procedures concerning the liability of launching States for damage caused by their space objects,

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*Taken from U.N. Doc. A/AC.105/115, April 27, 1973. (Footnotes are omitted.)

Taking note of the treaty relating to the moon [and other celestial bodies], concerning an international legal regime for the exploration and use of the moon [and other celestial bodies],

Desiring, in the light of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, to make provision for the registration by a launching State of space objects launched into outer space,

Desiring further to establish, on an obligatory basis, a central register of objects launched into outer space to be maintained by the Secretary-General of the United Nations,

Desiring also to provide for States parties additional means and procedures to assist in the identification of space objects for the purposes set out in this Convention,

Believing that a mandatory system of registering objects launched into outer space would, in particular, assist in their identification and would contribute to the application and development of international law governing the exploration and use of outer space,

Have agreed as follows:

Article I

For the purpose of this Convention:

(a) The term "launching State" means

(i) A State which launches or procures the launching of a space object;

(ii) A State from whose territory or facility a space object is launched.

(b) The term "space object" includes component parts of a space object as well as its launch vehicle and parts thereof.

(c) The term "State of registry" means a launching State on whose registry a space object is carried in accordance with article II.

Article II

1. When a space object is launched into earth orbit or beyond,* the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain. Each launching State shall inform the Secretary-General of the United

Nations of the establishment of such a registry.

2. Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this artlcle, bearing in mind the provisions of article VIII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and without prejudice to appropriate agreements concluded or to be concluded between the launching States on jurisdiction and control over the space object and over any personnel thereof.

3. The contents of and conditions under which each registry is maintained shall be determined by the State of registry concerned.

Article III

1. Each State of registry shall furnish to the Secretary-General, as soon as practicable, the following information concerning each space object launched into earth orbit or beyond.

(a) Name of launching State or States;

(b) An appropriate international designator or registration number;

(c) Date and territory or facility of launch;

(d) Basic orbital parameters, including:

(i) Nodal period,

(ii) Inclination,

(iii) Apogee, and

(iv) Perigee;

(e) General function of the space object.

2. A State of registry may, from time to time, provide the Secretary-General with additional information in relation to a space object it has launched into earth orbit or beyond.

3. Each State of registry shall notify the Secretary-General, to the greatest extent feasible and as soon as practicable, of space objects concerning which it has previously transmitted information, and which have been but no longer are in earth orbit.

Article IV

1. The Secretary-General shall maintain a central register in which the information furnished in accordance with article III shall be recorded.

2. There shall be full and open access to the information in this register.

Article V

Where the application of the provisions of this Convention has not enabled a State party to identify a space object which has caused damage to it or to any of its natural or juridical persons, or which may be of a hazardous or deleterious nature, other States parties, including in particular States possessing space monitoring and tracking facilities, shall respond to the greatest extent feasible to a request by that State party, or transmitted through the Secretary-General on its behalf, for assistance under equitable and reasonable conditions in the identification of the object. A State party making such a request shall, to the greatest extent feasible, submit information as to the time, nature and circumstances of the events giving rise to the request. Arrangements under which such assistance shall be rendered shall be the object of agreement between the parties concerned.

Article VI

1. With the exception of articles VII through XI of this Convention, references to States shall be deemed to apply to any international intergovernmental organization which conducts space activities if the organization declares its acceptance of the rights and obligations provided for in this Convention and if a majority of the States members of the organization are States parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

2. States members of any such organization which are States parties to this Convention shall take all appropriate steps to ensure that the organization makes a declaration in accordance with the preceding paragraph.

Article VII

1. This Convention shall be open to all States for signature. Any State which does not sign this Convention before its entry into force in accordance with paragraph 3 of this article may accede to it at any time.

2. This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of

the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the depositary Governments.

3. This Convention shall enter into force on the deposit of the fifth instrument of ratification.

4. For States Whose instruments of ratification or accession are deposited subsequent to the entry into force of this Convention, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification of and accession to this Convention, the date of its entry into force and other notices.

6. This Convention shall be registered by the depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article VIII

Any State party to this Convention may propose amendments to this Convention. Amendments shall enter into force for each State party to the Convention accepting the amendments upon their acceptance by a majority of the States party to the Convention on the date of acceptance by it.

Article IX

Any State party to this Convention may give notice of its withdrawal from the Convention one year after its entry into force by written notification to the depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.

Article X

This Convention, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited in the archives of the depositary Governments. Duly certified copies of this Convention shall be transmitted by the depositary Governments to the Governments of the signatory and acceding States.

In witness whereof the undersigned, duly authorized, have signed this Convention.

Done in _____, at the cities of _____, this ____day of _____, one thousand nine hundred and seventy-____

VI.

Draft Treaty Relating to the Moon*

The States Parties to this Treaty,

Noting the achievements of States in the exploration and use of the moon [and other celestial bodies],

Recognizing that the moon, as a natural satellite of the earth, has an important role to play in the exploration of outer space,

Determined to promote on the basis of equality the further development of co-operation among States in the exploration and use of the moon [and other celestial bodies],

Desiring to prevent the moon [and other celestial bodies] from becoming an area of international conflict,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, and the Convention on International Liability for damage caused by space objects,

Taking into account the need to define and develop the provisions of these international instruments in relation to the moon [and other celestial bodies] having regard to further progress in the exploration and use of outer space,

Have agreed on the following:

Article I

1. [As employed in this Treaty:

   (i) The term "celestial body" includes all natural celestial bodies other than the earth.

   (ii) The phase "the Moon and other celestial bodies" includes orbits around or other trajectories to or around celestial bodies.]

*Taken from U.N. Doc. A/AC.105/115, April 27, 1973. Provisions in the Draft Treaty on which agreement has not yet been reached are indicated by square brackets. (Footnotes are omitted.)

2. This Treaty does not apply to extra-terrestrial materials which reach the surface of the earth by natural means.

Article II

1. Activities on [in the exploration and use of] the moon [and in circumlunar space] [and other celestial bodies] shall be carried out in accordance with international law, including the Charter of the United Nations in the interest of maintaining international peace and security and promoting international co-operation and understanding.

2. In accordance with the Charter of the United Nations, the threat or use of force or any other hostile act or threat of hostile act on the moon [and other celestial bodies] is prohibited. It is likewise prohibited to use the moon [or other celestial bodies] in order to commit any such act or to engage in any such threat in relation to the earth, [the moon] or other celestial bodies, spacecraft, the personnel of spacecraft or man-made space objects.

Article III

1. The moon [and other celestial bodies] shall be used by all States Parties exclusively for peaceful purposes.

2. States Parties shall not place in orbit around or other trajectory to or around the moon [or other celestial bodies] objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the moon [or other celestial bodies].

3. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon [and other celestial bodies] shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration and use of the moon [and other celestial bodies] shall also not be prohibited.

Article IV

1. The exploration and use of the moon [and other celestial bodies] shall be the province of all mankind and [the exploitation of their natural resources] shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development. Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living conditions of economic and social progress and development in accordance with the Charter of the United Nations.

2. States Parties shall be guided by the principle of co-operation and mutual assistance in all their activities concerning the exploration and use of the moon [and other celestial bodies]. International co-operation in pursuance of this Treaty should be as wide as possible and may take place on a multilateral basis, on a bilateral basis, or through international intergovernmental organizations.

3. States Parties shall inform the Secretary-General as well as the public and international scientific community, to the greatest extent feasible and practicable, of their activities concerned with the exploration and use of the moon [and other celestial bodies]. They shall in any case give information on time, purpose, locations, orbital parameters, duration and results of each [completed] mission to the moon [and other celestial bodies], in particular on the scientific results arising out of such missions. In case of a mission lasting more than 60 days, information on conduct of the mission shall be given periodically at 30 days' intervals. For missions lasting more than six months, only significant additions to such information need be reported thereafter.

4. If a State Party becomes aware that another State Party plans to operate simultaneously in the same area of or in the same orbit around or trajectory to or around the moon or other celestial body, it shall promptly inform the other State of the timing of and plans for its own operations.

Article V

1. There shall be freedom of scientific investigation on the moon [and other celestial bodies] by all States Parties without discrimination of any kind, on the basis of equality and in accordance with international law.

2. In carrying out scientific investigations in furtherance of the provisions of this Treaty and the States Parties shall have the right to collect on and remove from the moon [and other celestial bodies] samples of its [their] mineral and other substances. Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes. States Parties shall have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation. States Parties may in the course of scientific investigations also use mineral and other substances of the moon [and other celestial bodies] in quantities appropriate for the support of their missions.

3. States Parties agree on the desirability of exchanging scientific and other personnel on expeditions to or installations on the moon [or other celestial bodies] to the greatest extent feasible and practicable.

Article VI

1. In exploring and using the moon [and circumlunar space] [and other celestial bodies] States Parties shall take measures to prevent the disruption of the existing balance of [its] [their] environment[s] whether by introducing adverse changes in such environment[s] [its] [their] harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to prevent harmfully affecting the environment of the earth through the introduction of extra-terrestrial matter or otherwise.

2. [States Parties planning missions to the moon [and other celestial bodies] shall notify the Secretary-General of measures being adopted to minimize the disruption of the existing balance of the environment[s] of [those bodies]. Such reports shall include the trajectories to be flown, the distance of closest approach, and specific measures taken to control micro-organisms on and in the spacecraft.]

3. [States Parties shall notify the Secretary-General of plans to place radio-active material on or in orbit or other trajectory around the moon [or other celestial bodies] and shall give similar notification with regard to the conditions and effects of such placement when it occurs.]

4. States Parties shall report to other States Parties and to the Secretary-General concerning areas of the moon [and other celestial bodies] having special scientific interest in order that consideration may be given to their designation as international scientific preserves for which special protective arrangements are to be agreed, without prejudice to the rights of other States Parties to this Treaty.

Article VII

1. States Parties may pursue their activities in the exploration and use of the moon [and other celestial bodies] anywhere on or below its [their] surface, [and in circumlunar space], subject to the other provisions of this Treaty.

2. For these purposes States Parties may, in particular:

(a) land their space objects on the moon [and other celestial bodies], and launch them from the moon [such bodies], [and place them in circumlunar orbit];

(b) place their personnel, space vehicles, equipment, facilities, stations and installations anywhere on or below the surface of the moon [and other celestial bodies] [and in circumlunar space];

Personnel, space vehicles, equipment, facilities, stations and installations may move or be moved freely over or below the surface of the moon [and other celestial bodies] [and in circumlunar space].

3. Activities of States Parties in accordance with paragraphs 1 and 2 of this article shall not interfere with the activities of other States Parties on the moon [and other celestial bodies]. Where such interference may occur, the States Parties concerned shall undertake consultations in accordance with article XVI.

Article VIII

1. States Parties may establish manned and unmanned stations on the moon [and other celestial bodies]. A State Party establishing a station shall use only that area which is required for the needs of the station and shall immediately inform the Secretary-General of the location and purposes of that station. Subsequently, at annual intervals that State shall likewise inform the Secretary-General whether the station continues in use and whether its purposes have changed.

2. Stations shall be installed in such a manner that they do not impede the free access to all areas of the moon of personnel, vehicles and equipment of other States Parties conducting activities on the moon [and other celestial bodies] in accordance with the provisions of this Treaty or of article I of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies.

Article IX

1. States Parties shall adopt all practicable measures to safeguard the life and health of persons on the moon [and other celestial bodies]. For this purpose they shall regard any person on the moon [or other celestial body] as an astronaut within the meaning of the article V of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies and as part of the personnel of a spacecraft within the meaning of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

2. States Parties shall offer shelter in their stations, installations, vehicles and other facilities to persons in distress on the moon [or other celestial bodies].

3. States Parties shall inform the Secretary-General, as well as the public and the international scientific community, of any phenomena they discover in outer space, including the moon and other celestial bodies, which could endanger human life or health, as well as any indication of organic life.

Article X

1. [The natural resources of the moon [and other celestial bodies] shall be the common heritage of all mankind.]

2. Neither States, international intergovernmental or non-governmental organizations, national organizations having the status of juridical persons or not, nor natural persons, may claim the surface or subsurface of the moon [or other celestial bodies] as their property. The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the moon [or other celestial bodies] including structures connected with its [their] surface or subsurface, shall not create a right of ownership over parts of the surface or subsurface of the moon [or other celestial bodies].

3. [Parts of the surface or subsurface of the moon [or other celestial bodies] may not be the object of grant, exchange, transfer, sale or purchase, lease, hire, gift or any other arrangement or transactions with or without compensation between States, international intergovernmental and non-governmental organizations or national organizations having the status of juridical persons or not, or of arrangements or transactions between natural persons.]

4. [The States Parties to this Treaty, bearing in mind the need for economic advancement and for the encouragement of investment and efficient development if utilization of the resources of the moon and other celestial bodies becomes a reality, recognize the importance of concluding agreements in this area. To this end, the Depositary Governments shall promptly convene a meeting of all States Parties with a view to negotiating arrangements for the international sharing of the benefits of such utilization when one-third of the States Parties inform the Depositary Governments that they consider that practical utilization of the resources of the moon or other celestial bodies is likely to begin within two years following or has already begun.]

Article XI

1. States Parties shall retain jurisdiction and control over their personnel, vehicles, equipment, facilities, stations and installations on the moon [and other celestial bodies]. The ownership of space vehicles, equipment, facilities, stations and installations shall not be affected by their presence on the moon [or other celestial bodies].

2. Vehicles, installations and equipment or their component parts found in places other than their intended location shall be dealt with in accordance with article V of the Agreement on Assistance to Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

3. In the event of an emergency involving a threat to human life, States Parties may use the equipment, vehicles, installations, facilities or supplies of other States Parties

on the moon [or in circumlunar space] [or other celestial bodies]. Prompt notification of such use shall be made to the Secretary-General or State Party concerned.

Article XII

A State Party which learns of the crash landing, forced landing or other unintended landing on the moon [or other celestial body] of a space object, or its component parts, that were not launched by it, shall promptly inform the launching State Party and the Secretary-General of the United Nations.

Article XIII

1. States Parties to this Treaty shall bear international responsibility for national activities on the moon [and other celestial bodies] whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. States Parties shall ensure that non-governmental entities under their jurisdiction shall engage in activities on the moon [and other celestial bodies] only under the authority and continuing supervision of the appropriate State Party.

2. [In addition to the provisions of article VII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, a State Party shall be liable for damage resulting from its act or omission or from an act or omission of its personnel on the moon to the property or personnel of other States Parties on the moon, unless it is established that the damage occurred through no fault of the said State or of its personnel on the moon.]

Article XIV

With the exception of Articles XVIII to XXI, references in this Treaty to States shall be deemed to apply to any international intergovernmental organization which conducts space activities if the organization declares its acceptance of the rights and obligations provided for in this Treaty and if a majority of the States members of the organization are States Parties to this Treaty and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies. States members of any such organization which are States Parties to this Treaty shall take all appropriate steps to ensure that the organization makes a declaration in accordance with the foregoing.

Article XV

In the event of any difference arising between States Parties with regard to the interpretation [or application] of the provision of this Treaty, reference shall be made where appropriate to the provisions of the Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and other Celestial Bodies, the Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, and the Convention on International Liability for Damage caused by Space Objects.

Article XVI

1. Each State Party may assure itself that the activities of other States Parties in the exploration and use of the moon [and other celestial bodies] are compatible with the provisions of this Treaty. To this end, all space vehicles, equipment, facilities, stations and installations on the moon [and other celestial bodies] shall be open to other States Parties. Such States Parties shall give reasonable advance notice of a projected visit, in order that appropriate consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited. In pursuance of this Article, any State Party may use its own means, or may act with the full or partial assistance of any other State Party, or through appropriate international procedures within the framework of the United Nations and in accordance with the Charter.

2. A State Party which has reason to believe that another State Party is not fulfilling the obligations incumbent upon it pursuant to this Treaty or that another State Party is interfering with the rights which the former State has under this Treaty may request consultations with that Party. A State Party receiving such a request shall enter into such consultations without delay. Any other State Party which requests to do so shall be entitled to take part in the consultations. Each State Party participating in such consultations shall seek a mutually acceptable resolution of any controversy and shall bear in mind the rights and interests of all States Parties. The Secretary-General shall be informed of the results of the consultations and transmit the information received to all States Parties concerned.

3. If the consultations do not lead to a mutually acceptable settlement which has due regard for the rights and interests of all the States Parties, the parties concerned shall take all measures to settle the dispute by other peaceful means of their choice and appropriate to the circumstances and the nature of the dispute. If difficulties arise in connexion with the opening of consultations or if consultations do not lead to a mutually acceptable settlement, any State Party may seek the assistance of the Secretary-General without seeking the consent of any other State Party concerned, in order to resolve the controversy. A State Party which does not maintain diplomatic relations with another State Party concerned shall participate in such consultations, at its choice, either itself or through another State Party or the Secretary-General, as intermediary.

Article XVII

At any time after this Treaty has been in force for five years, at the request of one-third of the States Parties to the Treaty and with the concurrence of the majority of the States Parties a conference of the States Parties shall be convened to review this Treaty.

Article XVIII

1. This Treaty shall be open to all States for signature. Any State which does not sign this Treaty before its entry into force in accordance with paragraph 3 of this article may accede to it at any time.

2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of. . . , which are hereby designated the Depositary Governments.

3. This Treaty shall enter into force upon the deposit of instruments of ratification by five Governments including the Governments designated as Depositary Governments under this Treaty.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification of and accession to this Treaty, the date of its entry into force and other notices.

6. This Treaty shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article XIX

Any State Party to the Treaty may propose amendments to this Treaty. Amendments shall enter into force for each State Party to the Treaty accepting the amendments upon their acceptance by a majority of the States Parties to the Treaty and thereafter for each remaining State Party to the Treaty on the date of acceptance by it.

Article XX

Any State Party to the Treaty may give notice of its withdrawal from the Treaty one year after its entry into force by written notification to the Depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.

Article XXI

This Treaty, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

IN WITNESS WHEREOF the undersigned, duly authorized, have signed this Treaty.

DONE in _____, at the cities of _____, the _____ day of _____one thousand nine hundred and seventy_____.

VII.

U. S. POLICY GOVERNING THE PROVISION OF LAUNCH ASSISTANCE*

I. United States launch assistance will be available to interested countries and international organizations for those satellite projects which are for peaceful purposes and are consistent with obligations under relevant international agreements and arrangements, subject only to the following:

A. With respect to satellites intended to provide international public telecommunications services:

1. The United States will provide appropriate launch assistance for those satellite systems on which Intelsat [International Telecommunications Satellite Organization] makes a favorable recommendation in accordance with article XIV of its definitive arrangements.

2. If launch assistance is requested in the absence of a favorable recommendation by Intelsat, the United States will provide launch assistance for those systems which the United States had supported within Intelsat so long as the country or international entity requesting the assistance considers in good faith that it has met its relevant obligations under article XIV of the definitive arrangements.

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*Taken from 67 Dept. St. Bull. 534 (1972).

3. In those cases where requests for launch assistance are maintained in the absence of a favorable Intelsat recommendation and the United States had not supported the proposed system, the United States will reach a decision on such a request after taking into account the degree to which the proposed system would be modified in the light of the factors which were the basis for the lack of support within Intelsat.

B. With respect to future operational satellite applications which do not have broad international acceptance, the United States will favorably consider requests for launch assistance when broad international acceptance has been obtained.

II. Such launch assistance will be available, consistent with U.S. laws, either from U.S. launch sites (through the acquisition of U.S. launch services on a cooperative or reimbursable basis) or from foreign launch sites (by purchase of an appropriate U.S. launch vehicle). In the case of launchings from foreign sites the United States will require assurance that the launch vehicles will not be made available to third parties without prior agreement of the United States.

III. With respect to the financial conditions for reimbursable launch services from U.S. launch sites, foreign users will be charged on the same basis as comparable non-U.S. Government domestic users.

IV. With respect to the priority and scheduling for launching foreign payloads at U.S. launch sites, such launchings will be dealt with on the same basis as U.S. launchings. Each launching will be treated in terms of its own requirements and as an individual case. When it becomes known when a payload will become available and what its launch window requirements will be, the launching will be scheduled for that time. Should a conflict arise, the United States will consult with all interested parties in order to arrive at an equitable solution.

VIII.

U.S. and CANADA CLARIFY AGREEMENT ON TELECOMMUNICATIONS SATELLITES*

Following are texts of letters exchanged by Bertram W. Rein, Deputy Assistant Secretary for Transportation and Communications, with K. B. Williamson, Minister of the Embassy of Canada at Washington, and F. G. Nixon, Administrator, Telecommunications Management Bureau, Canadian Department of Communications, setting forth steps to be followed in the event Telesat Canada institutes international service.

*Taken from 68 Dept. St. Bull. 145-7 (1973).

CANADIAN LETTER OF NOVEMBER 6

November 6, 1972.

Dear Mr. Rein, This will confirm our informal advice to the State Department last May, to the effect that Telesat Canada is taking steps to have its objects amended. The draft amendment, as approved by Telesat Canada, is set forth in the attached annex.

The Corporation has instituted this action since it has perceived the possible application of satellite communications technology to national resource developments such as the proposed Mackenzie Valley gas pipeline which, when realized, would undoubtedly have communications requirements largely within Canada, but also to certain nearby points in the United States. More recently, as you are aware, several U.S.A. domestic satellite communications system applicants have expressed an interest in the short term use of Telesat facilities for service between points in the United States.

It is Telesat Canada's intention, if and when their objects are so amended, that the services provided to and between points outside Canada would be incidental and peripheral to the main Canadian domestic service of the Corporation. It is, of course, recognized that any service involving points within the United States would require the approval of your Government. Insofar as service between U.S.A. points is concerned, it is also recognized that it would normally be agreed to only when there existed an insufficiency of U.S.A. domestic facilities. These principles are endorsed by the Minister of Communications and the Secretary of State for External Affairs who assume that you would agree to the application of the same principles in a reciprocal situation when your domestic satellite systems are in operation.

We should also say that Telesat Canada's operation, and this is particularly significant if it involves international public telecommunication services, will be consistent with Canada's obligations under the Intelsat Agreement, expected to come into force shortly.

As you know the Telesat Canada Act requires that the amending letters patent, issued for the purpose of extending the objects of the Corporation, be laid before Parliament. They become effective if after thirty sitting days they have not been annulled by a resolution of either House. The amending letters patent have not yet been laid before Parliament which means that the proposed extension of Telesat's objects cannot become effective before late December at the earliest.

Inasmuch as our 1969 understanding on the provision of the forthcoming series of launch services for the Telesat satellites is based on the system being used for Canadian domestic telecommunications services and although these will still be the only services

Telesat Canada will be empowered to provide at the time of the first launch on November 9, we would appreciate receiving your comments on the foregoing intention.

Yours sincerely,

K. B. Williamson, *Minister.*
F. G. Nixon, *Administrator,*
Telecommunications Management Bureau,
Department of Communications.

Mr. Bertram W. Rein,

Deputy Assistant Secretary for Transportation & Telecommunications, Department of State, Washington, D.C.

PROPOSED AMENDMENTS TO TELESAT CANADA ACT

(i) Delete from subsection (1) of section 5 which reads:

"The objects of the company are to establish satellite telecommunication systems providing, on a commercial basis, telecommunication services between locations in Canada."

and substitute therefor the following:

"The objects of the company are to establish satellite telecommunication systems providing on a commercial basis, telecommunication services

(a) between locations in Canada; *and*

(b) *subject to the appropriate intergovernmental arrangements to and between other locations."*

(ii) Delete from paragraph (c) of subsection (1) of section 6 thereof the words "between locations in Canada" so that the said paragraph (c) is to read:

"the power to enter into contracts on such terms and conditions as it considers reasonable for the provision of telecommunication services by satellite."

(iii) Delete from paragraph (d) of subsection (1) of section 6 which reads:

"the power to conduct research and developmental work in all matters relating to telecommunication by satellite;"

and substitute therefor the following:

"the power to conduct research and developmental work and to provide managerial, engineering and other services in all matters relating to telecommunication by satellite and satellite systems;"

U.S. LETTER OF NOVEMBER 7

November 7, 1972.

Honorable Kenneth B. Williamson,
Minister, Embassy of Canada,
1746 Massachusetts Avenue, N.W.,
Washington, D.C.

Dear Mr. Minister: This is in response to your letter of November 6, 1972, jointly signed by Mr. F. G. Nixon, confirming your earlier informal advice to the Department of State that TELESAT Canada is taking steps to have its objects amended and asking for our comments on this intention.

As you have noted, the United States commitment to provide launch services was for a domestic Canadian satellite system, and, indeed, we understand the TELESAT Act does not now authorize TELESAT to provide other than Canadian domestic telecommunication service. You advise it is now intended that the objects of the Corporation under the TELESAT Act be amended to include authority to handle international traffic as well as the domestic traffic of other countries. Although the proposed statutory language is quite broad, you have indicated it is intended that the satellites to be launched by the United States would be used only to provide telecommunication service to and between locations outside Canada which was incidental and peripheral to the main Canadian domestic service of the Corporation and would be consistent with Canada's obligations under the INTELSAT Agreement. In any event, any provision of other than Canadian domestic telecommunication service would, as required by Subsection (1) (b) of Section 5 of the TELESAT Canada Act as proposed in the draft amendment be provided "subject to the appropriate intergovernmental arrangements".

Under these circumstances, we believe that the launch service to be furnished by the United States must be premised on your adherence to the following condition. Prior to the institution of any international public telecommunications service utilizing satellites launched pursuant to the 1969 understanding, the Canadian authorities will submit the proposal to the INTELSAT Assembly of Parties in accordance with paragraph (d) of Article XIV of the INTELSAT definitive agreements. Such service shall not be inaugurated unless:

(a) The proposal receives a favorable recommendation in the INTELSAT Assembly (for these purposes a favorable recommendation requires a two-thirds favorable vote); or

(b) The proposal is supported by the USG [U.S. Government], and the Canadian authorities, in the absence of a favorable recommendation by the INTELSAT Assembly, consider in good faith that they have met their obligations under Article XIV; or

(c) The Canadian authorities, in the absence of a favorable recommendation by the INTELSAT Assembly, when the USG does not support the proposal, consider they have met their obligations under Article XIV, and the USG, after taking into account the degree to which the proposal has been modified in the light of the factors which were the basis for the lack of support within INTELSAT, thereafter communicates its support of the proposal.

Since we would assume that any proposal for international telecommunication service to points within the United States would not be made in the absence of prior United States concurrence and, would therefore have United States support in INTELSAT, such services would be consistent with the above conditions.

As was pointed out to Canadian authorities in correspondence dated June 23, 1972, there are, we believe, certain special circumstances where it would be in the interest of both our countries not to preclude our domestic satellite telecommunications systems from providing assistance to one another. One such case would be the provision of support and assistance, subject to the availability of facilities and to the extent it is technically feasible, in the case of catastrophic failure of either system. Another would be for each system to be in a position to assist the other country in meeting its domestic telecommunication needs via satellite either when the other country does not yet have a system in operation or when it may have a temporary shortage of adequate facilities. A third case would be the extension of service to a point or points in the other country where such service was incidental and peripheral to the provision of what was clearly and essentially a domestic service. The implementation of any proposal for services of the type discussed in this paragraph will be subject to approval by appropriate representatives of both Governments.

We would appreciate receiving confirmation that you share the views expressed herein, and that this exchange of letters constitutes an "intergovernmental arrangement" within the meaning of the proposed amendment to the TELESAT Act.

Sincerely yours,

Bert W. Rein,
Deputy Assistant Secretary,
Bureau of Economic and
Business Affairs.

CANADIAN LETTER OF NOVEMBER 8

November 8, 1972.

Dear Mr. Rein, We refer to your letter of November 7, 1972. We are able to confirm Canadian acceptance of the views and understandings which you have expressed in the paragraphs 4 and 5 of your letter and, more particularly, for the purposes of the satellites launched pursuant to the 1969 understanding, the conditions which you have specified in the third paragraph.

We hereby confirm that our letter of November 6, 1972, your letter of November 7, 1972, and this reply constitute an "intergovernmental arrangement" within the meaning of the proposed amendment to the objects and powers under the Telesat Canada Act.

With the completion of this exchange of letters, we believe it would now be appropriate to encourage the relevant agencies and parties to further explore and define the agreed areas of mutual interest for co-operation.

Yours sincerely,

K. B. Williamson, *Minister.*
F. G. Nixon, *Administrator,*
Telecommunications Management Bureau,
Department of Communications.

Mr. Bertram W. Rèin,

Deputy Assistant Secretary for Transportation & Telecommunications, Department of State, Washington, D.C.

IX.

U.S. TO PROVIDE LAUNCH SERVICES FOR BRITISH SATELLITES*

Press release 9 dated January 17, 1973.

The United States and the United Kingdom on January 17 concluded an agreement that provides for U.K. access to U.S. space launch capabilities on a reimbursable basis. Under the terms of the agreement, the U.K. Department of Trade and Industry will purchase appropriate boosters and launching services from the U.S. National Aeronautics

*Taken from 68 Dept. St. Bull. 190-1 (1973).

and Space Administration for satellite projects undertaken by DTI. The launchings will be conducted at NASA launch sites in the United States.

The first U.K. satellite planned to be launched under the agreement is the X-4 technology research satellite. A Scout launch vehicle will be used to place the payload into orbit. The launch is scheduled to take place at the U.S. Western Test Range in 1974.

The agreement represents another link in continued U.S.-U.K. cooperation in space activities that since 1960 has included U.K. support of several NASA tracking stations, joint testing of experimental communications satellites, numerous sounding rocket projects, lunar sample experiments by British scientists, and cooperative scientific satellite projects involving four launchings to date, with one additional payload to be launched in 1973.

In a ceremony marking the exchange of diplomatic notes concluding the agreement, Under Secretary of State for Political Affairs U. Alexis Johnson noted that "it is fitting that the first agreement for foreign access to U.S. space launch capabilities pursuant to the President's announcement on October 9, 1972, is with the United Kingdom, with whom we have traditionally had close ties in scientific and technological cooperation."

The British Ambassador to the United States, the Earl of Cromer, said: "This agreement between our two governments provides a firm and welcome assurance of the future continuation of cooperation, which admirably reflects the spirit of the announcement by the President of the United States on 9 October 1972 about the provisions by the United States of launch assistance to foreign states."

There were many professional meetings worthy of notation in 1973. The Goddard Space Flight Center of NASA sponsored an "ERTS-1 Symposium" which was held on March 5-9, 1973, in New Carrolton, Maryland. The Symposium dealt with a wide range of subjects including the use of earth resources technology satellites in relation to: mineral resources, geological structure, and landform surveys; agriculture, forestry and range resources; water and marine resources, and ocean surveys; land use and mapping; and developments in interpretation techniques.

The Executive Committee and officers of the United States Membership of the International Institute of Space Law of the International Astronautical Federation held a meeting on April 14, 1973, in Washington, D.C. during the annual session of the American Society of International Law. Items under discussion included membership drive, future program, dues, the Journal of Space Law, participation in the Baku Conference, the question of monetary contribution by the U.S. Membership to the International Institute of Space Law and other matters.

On August 8, 1973, during the annual meeting of the American Bar Association in Washington, D.C., its International Law Section's Standing Committee on Aeronautical Law sponsored a program in conjunction with the International Institute of Space Law under the chairmanship of Brig. Gen. Martin Menter (USAF, ret.). The theme of the program which was held at the Goddard Space Flight Center in Beltsville, Maryland, focused on "Studying the Earth From Space: Scientific and Legal Implications." Participants in the program included Donald P. Hearth, Deputy Director of the Goddard Space Flight Center, Dr. Paul D. Lowman, Experimenter Geologist, S. Neil Hosenball, Deputy General Counsel of NASA, John Cavanagh, Edward R. Finch, Jr., and Professor Stephen Gorove.

The World Conference on Aerospace and International Law and Trade was held as part of the XVIII Conference of the Inter-American Bar Association in Rio de Janeiro, Brazil, on August 18-24, 1973, under the chairmanship of Judge Harold Berger. Papers were presented by Ambassador Edward R. Finch, Jr. and Professor Stephen Gorove on "Property Rights in Outer Space" and "The Concept of Damage in Space Law." The Conference adopted two resolutions dealing with space communications and freedom of information.

The Fourteenth International Symposium on Aerospace Law was held under the auspices of the Committee on Aerospace Law of the Federal Bar Association and as part of the 53rd annual FBA Convention in Chicago, Illinois, on September 10-14, 1973.

The XVIth Colloquium on the Law of Outer Space took place in Baku, on the Caspian Sea, October 8-13, 1973, in connection with the 25th Congress of the International Astronautical Federation. At the session which was presided over by Professor G. P. Zhukov of the U.S.S.R., a large number of papers were presented on such topics as "Space Law and General International Law", "Direct Television Broadcasting",

"Teledetection of Earth Resources by Satellites", "Moon and Other Celestial Bodies", "Orbital Earth Stations," and various other topics. Also during the same Colloquium the "Third Symposium on the Teaching of Space Law" was held.

On November 2, 1973 under the chairmanship of Professor Stephen Gorove, the University of Mississippi Law Center hosted a regional conference on "Recent Developments in Space Law", which was co-sponsored by the American Society of International Law and the L.Q.C. Lamar Society of International Law. Dr. Jerry C. McCall, Executive Vice Chancellor gave the key note address, S. Neil Hosenball, Deputy General Counsel of NASA spoke on "Current Issues of Space Law Before the United Nations", Katherine Drew Hallgarten, President of the Washington Foreign Law Society, talked on "The Influence of Communications Laws and Regional Arrangements in the Americas", Professor Stephen Gorove addressed the group on "Property Rights in Outer Space", Brigadier General Martin Menter dwelled upon "Jurisdiction over Man-Made Orbital Satellites", and Professor Aldo Armando Cocca of Argentina submitted a paper on "The Supreme Interests of Mankind Vis-a-Vis: The Emergence of Direct Broadcast." The presentation of papers was followed by panel and open discussions. The papers are being published in the Spring 1974 issue of the Journal of Space Law.

During the forthcoming annual meeting of the American Society of International Law on April 25-27, 1974, in Washington, D.C. a Workshop is expected to be held on the International Law of Outer Space.

The XVIIth Colloquium on the Law of Outer Space is scheduled to take place in October 1974 in West Germany in conjunction with the 26th Congress of the International Astronautical Federation.

The Politics and Technology of Satellite Communications, by Jonathan F. Galloway, Lexington Books, D. C. Heath & Co. (Lexington, Mass., Toronto, London, 1972, pp. 247.)

The author is Associate Professor of Politics at Lake Forest College; he received his doctorate at Columbia University. Professor Galloway's decision to write a book on the politics and technology of satellite communications is well taken, because communication satellites represent one of the most practical applications of outer space activities. Moreover, at the present time, communications satellites are observed as a means of modern mass information.

The book gives a good insight of the history and development of space communications, and it also deals with the political background of the decisions in this field, especially as studied from the point of view of the political position of the United States.

The subject of communication satellites is rather complicated; however the author has succeeded in his goal of producing a very clear and thorough study of the subject.

The book is divided into nine chapters, and conclusions are added to the majority of these chapters.

In Chapter 1, the Introduction, the author gives the essence of the book as follows: "The present study approaches this general task by examining one technological innovation—satellite communications—as it relates to three basic processes:

1. The relation of innovations in policy and the policy-making process,

2. The distincion or lack of distinction between domestic and foreign policy decision-making,

3. The processes of rational decision-making characteristic of and appropriate for issues which are complex because of the consequences of technological innovations". (P. 1.)

The author rightly observes that these processes cannot be understood in isolation because they are intertwined.

In Chapter two, the author treats Traditional Communications and Policy and the Coming of the Space Age, and he describes the beginning of communications, observing that "American leadership in international communications was challenged by the Soviets when they orbited Sputnik I. Into the communications environment, a new technique presented itself with potentially revolutionary consequences for communications". (P. 16.) Indeed has the United States responded to the Soviet challenge.

Chapter three examines the Early Development in Space Communications. Several sides of the early developments are treated, such as the Government-Industry Relations 1960-1961, Congressional Attitudes, etc.

Important parts of the book are the Chapters four and five, dealing with The Passage of the Communications Satellite Act of 1962 and The Interim Arrangements for a Global Commercial Communications Satellite System, both of which treat the basis of an operational space communications system.

It should be remembered that "one of the principal aims of the Communications Satellite Act is to promote efficient and economical use of the electromagnetic frequence spectrum". (P. 75.) Interesting observations are made in Chapter five on the Direct Broadcasting from Satellites on which subject France and the United States have offered contradictory proposals, whereas the Soviet Union supported the United States position. Prof. Galloway argues "The French proposal would have prohibited the television or radio broadcasts from any space object. The American proposal would have permitted experimental broadcasting in technically suited bands then allocated to the broadcast service, pending further studies by the CCIR". This Chapter also devotes attention to the coordinating role of the International Telecommunication Union (I.T.U.). The I.T.U. is one of the specialized agencies of the United Nations. It divides and registers the radiofrequencies, and it takes all necessary measures to prevent that radio- and television broadcasting of the different countries disturb each other. Space communications are also one of their aims.

The principal organizations in the field of communication are the International Telecommunications Satellite Consortium (INTELSAT) and the Communications Satellite Corporation (COMSAT). In Chapter five the author examines the establishment of INTELSAT. The INTELSAT-consortium was established by the Interim International Agreement of 1964: seventy-seven states are a member of INTELSAT. According to the definitive Agreement of 1971, INTELSAT has been composed of four bodies, namely Assembly of Parties (Art. VII), Assembly of Signatories (Art. III), Board of Governors (Art. X) and the Director General (Art's XI and XII). The private company, COMSAT, is the operator of the satellites; it is a legal entity chartered under U.S. domestic law.

The Agreements of INTELSAT have been in force since 12 February 1973, and the author treats the Transition between the Interim and Definitive Arrangements for INTELSAT in Chapter eight.

Chapter six deals with the Projects West Ford and Advent. As the author states: "Project West Ford was a passive communications satellite program conducted for the Air Force by the Lincoln Laboratory of the Massachusetts Institute of Technology. The project involved the dispensing into orbit of 400 million tiny copper dipoles 0.7 inch long and 0.0007 inch in diameter in a belt around the earth". The project West Ford has been internationally critisized; the author mentions that according to the Space Science Board,

the experiment was not harmful to either optical or radio astronoms. This reviewer wonders, however, if this view is not a bit too optimistic?

Significant information is contained in Chapter seven, because an extensive study of INTELSAT and INTERSPUTNIK is given. On November 15, 1971, the U.S.S.R. and eight socialistic states concluded an agreement similar to that of INTELSAT. In this connection may be mentioned the subsequently published study of W.von Kries[1], for the reason that later treatise is one of the very few dealing with the new organization of INTERSPUTNIK.

Chapter nine contains general conclusions. The author mentions that "In summary, one may say that American policy for satellite communications has proved a success by its own standard. There are failings in policy but these relate to the achievement of ends which are inherently paradoxical or must be achieved in future years". (P. 176.)

The usefulness of the book has been enhanced by the inclusion of two appendixes. Appendix A contains a survey of the U.S. and INTELSAT Communications Satellites 1958-1972; Appendix B gives a summing up of International Telecommunications Satellite Consortium Members, Quotas and Utilization. A Bibliography and a good Index have also been added. In my opinion, it would have been more logical to place the footnotes at the end of the chapters, rather than after the appendixes.

The book is dedicated to the memory of his father, George Barnes Galloway.

Professor Galloway has produced a thorough piece of work, which can be strongly recommended to all international lawyers interested in space communications.

Isabella Diederiks-Verschoor
Baarn, The Netherlands

Law and Politics in Outer Space--A Bibliography, by Irvin L. White, Clifton E. White, John A. Vosburgh. The University of Arizona Press (Tucson, Arizona, 1972, $6.95).

This book is the result of a six-year reserch project conducted by the Department of Government and Institute of Government and Institute of Government Research of the University of Arizona, supported by a NASA grant. A 172 page paperback, the materials in this bibliography are grouped by topic and source and constitute a basic guide to selected publications on legal and political problems concerning outer space. The principal researchers are political scientists whose apparent goal is to interest other political scientists in the problems of outer space and international law research on the

[1] W.von Kries, Intersputnik, Sozialistiches Gegenstück zu Intelsat, 22 Zeitschrift für Luftrecht 12 (1973).

subject. The data gathered is not exhaustive, though comprehensive, but the criteria for selectivity are not stated. The legal selections are from a number of law journals, excluding student work (e.g. comments). Through published in 1972, most entries stop in 1969 (some exceptions include the Journal of Air Law and Commerce which goes up to 1970). Considering that the major treaty on space law was signed in 1967[1], and that much was written between 1969 and 1972,[2] this bibliography missed the opportunity of being current as of its date of publication.

The bibliography is not annotated and there are no cross-references, which in this type of literature would seem indispensable to guide the user. Outer space literature has a special jargon which is a mixture of scientific terms, political science terminology and international law concepts, and is likely to confuse the uninitiated reader. A glossary of terms would have significantly enhanced it as it would have assisted the user in his research efforts.

The introduction written by Professor White is, however, most helpful as general guidance for research. Notwithstanding the dryness of the subject he chose to write on, Professor White does it with clarity and perception.

A major contribution made by this bibliography is that it serves as a bridge between international lawyers and political scientists. Unlike other areas of mutual interest between these two disciplines, this one has developed so rapidly that the challenges it presents are both present and immediate. Outer space is not similar to existing regimes of finite dimensions (*e.g.* the earth, the sea, and even air space). It compels us to transcend the bounds of these known regimes and to chart in theory and practice a new course for this common environment of mankind and the era it is ushering us into. Because of the importance of the subject matter and the comprehensive nature of this compilation, it is recommended to all libraries and interested researchers.

M. Cherif Bassiouni
Professor of Law, DePaul University

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[1]Treaty on Principles Governing Activities of States in Exploration and Use of Outer Space including the Moon and Other Celestial Bodies, Jan. 27, 1967. T.I.A.S. No. 6347 [1967] 18 U.S.T. 2610.

[2]See *e.g.* Gorove, Freedom of Exploration and Use in the Outer Space Treaty: A Textual Analysis and Interpretation, Denver J. Int. L. & Pol. 93 [1971] and Aero-Space Law Symposium, 20 DePaul L. Rev. 323,581 [1970].

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IN MEMORIAM OF

WILFRED C. JENKS

After the current issue of the *Journal of Space Law* went to press, came the saddening news of the sudden death of Clarence Wilfred Jenks, a member of the Editorial Advisory Board of the *Journal of Space Law.*

Mr. Jenks had a very distinguished career both as an international civil servant and as a recognized authority in the field of international law. He served over the span of a long life-time as Legal Advisor, Assistant Director General and, since 1970, as Director General of the International Labor Office in Geneva. He wrote extensively and with a keen insight on such topics as The International Protection of Trade Union Freedom (1957), The Common Law of Mankind (1958), The Proper Law of International Organizations (1962), Space Law (1965), and many other subjects.

His colleagues on the Advisory Board and members of the Editorial Staff of the *Journal of Space Law* share with the international community, relatives and friends the sincere grief over the loss of a world citizen and a pioneer of space law of truly international stature.

Stephen Gorove
Chairman of the Editorial
Advisory Board
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