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communications, to the launching of geodetic, mapping and auxiliary satellites, and to the realization of manned sidereal flights for peaceful purposes.

Probe rockets, earth satellites, instruments for the exploration of space and the network of observation stations as instruments of man's scientific activities must be utilized for research toward the improvement of equipment and space vehicles, as other auxiliaries to determine more satisfactory trajectories or to make more precise the recognition of orbits, effecting physical terrestrial observations and research, not only theoretically but also through mathematical methods.

This vast amount of space activities which trace the very real and dramatic limits of war or peace, should be assigned by the governments and their official organizations such as the United Nations to the Peaceful Use of Outer Space, by means of international agreements concerning the use of radio frequencies, registration of orbital components, continuous radio-transmission, the elimination of exhausted satellites, return to the atmosphere and recovery of space vehicles, return of equipment and space contamination.

Those nations that launch objects into space, be it in predetermined orbits or beyond, should pass on such information to the UN Commission so that this Commission may be apprised of such launchings.

These international agreements will lead to order, security and progress, which are the contents, but not the correlatives, of universal justice.

Lastly, to freedom and peace, which are the most prized possessions of mankind.

SPACE EXPLORATIONS AND SPACE LAW*

BY DR. VICTOR JOSÉ DELASCIO†

SINCE that historic date of October 4, 1957 when Russia launched the first Sputnik into orbit, soon followed by the United States launching other satellites, a new world was opened to man which will change completely ideas, science, medicine, communications and life itself. The Sputniks were followed by the Luniks, Vanguards, Tiros, Explorer, Transit, Echos, Courier, Discoverers, Cosmos, etc., and tomorrow there will be Samos, Nimbus, Centaur and hundreds of others.

Many sociologists and historians maintain that space probes may replace those forces that historically have driven nations into armed conflict. Their theory is based upon the hope that the conquest of space can, perhaps, be the moral equivalent of war, substituting certain material and psychological needs. Further, it is hoped that the absorption of energy, resources, imagination and the strong impetus of putting into effect these space adventures may be an effective medium for maintaining the peace.

Mankind will never forget another no less memorable date, April 12, 1962, when the first manned spaceship Vostok was launched in the Soviet Union. Major Yuri Alexseevich Gagarin made the first non-controlled orbital flight around the world in eighty-nine minutes, at a speed of

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28,900 kilometers per hour. This successful feat opened new horizons to the probe and exploration of outer space. Engineers already have provided man with the necessary space vehicle. Medical researchers are studying many factors related to life in space—in order to make possible the flight of man into those immeasurable regions. To place man safely in an entirely new environment requires much more extensive and profound knowledge of human biology than we now possess. In the field of technical medicine, good results have been obtained from space flight exploration programs. With regard to man's quest for knowledge, it can be said that no enterprise has excited human imagination more than our eagerness to probe into space. New worlds to conquer, new distances to travel, new problems to solve, new information to be gathered in all branches of human knowledge will take us inevitably into the search for better, deeper and more universal education. Already space explorations have been useful in extending science and technology into numerous specializations.

In this study we shall confine ourselves solely to analyzing a few fields in which space exploration is bringing about good results. In the field of meteorology, NASA (National Aeronautics and Space Administration) has announced a program which calls for the launching of 300 satellites during the next ten years; in the field of communications, American Telephone and Telegraph Company is studying a coordinated system of fifty relay stations which will change the communications media completely; the United States defense and alert system may be based upon this system. On August 12, 1960, the United States put into orbit the Echo satellite and in October of that same year launched the "active" communications vehicle "Courier," equipped with transmitters, receptors and an electronic belt which enabled the reception and transmission of messages in accordance with instructions sent from earth. These satellites are being used to initiate a new system of communications in outer space. One of the principal characteristics of this new system will be the automatic translation of one language into another.

Returning to meteorology, we recall that in April of 1960 a new era was opened in the history of atmospheric exploration by man. At that time Tiros I, the first meteorological satellite, was launched by the United States; it was followed by Tiros II which was orbited on November 23, 1960 and Tiros III on July 12, 1961. These satellites take television pictures of atmospheric coverings and clouds and make meteorological observations while circling the earth. They also assist in the search for tornadoes and hurricanes. In the near future this class of satellite will enable simultaneous observation of all regions. The United States plans to launch another satellite, the "Numbu," in 1962, with an almost polar orbit. It will permit observation of the entire surface of the earth at a height of 1,100 kilometers, and will carry various instruments to measure solar and terrestrial radiation. This class of exploration will be of great assistance, especially to aviation, maritime navigation and commerce.

Just as the great voyages of discovery in the XV and XVI centuries brought about the conquest of new territories, probing voyages in space will lead man to the conquest of mysterious and unlimited regions and will advance science, the arts, education and human knowledge.

The basic sciences of engineering contribute to these voyages by fur-

nishing the vehicles and equipment necessary to the exploration of outer space. Medicine, psychiatry and biology are increasing their contributions by attaining solutions to the problem of adapting man to space conditions. But the science of social engineering through law, as denominated by Professor Goodhart, has been very slow to furnish adequate rules of human behavior in space. A longer delay or possible failure could lead to chaos. As maintained by Professor Goodhart, law is the structure without which society will crumble.

In our opinion, an effective and logical structure would require a new international agreement, preferably on a world basis. Time is of the essence, for space conquests will not await the will of the legislator. In September of 1960 President Eisenhower, before the General Assembly of the United Nations, concerned with the lack of international agreement, warned the world with these words:

Another problem confronting us involves outer space. The emergence of this new world poses a vital question: Will outer space be preserved for peaceful use and developed for the benefit of all mankind? Or will it become another focus for the arms race, and thus an area of dangerous and sterile competition? The choice is urgent.

It is common knowledge that the many satellites already launched are still circling the Earth without any juridical regulation. It appears that the states have tacitly permitted the launching of satellites with the presumption of international cooperation. Certain principles of international law, universally recognized, could solve some of the problems. But, there are many other problems which are outside all conventions and beyond the scope of all existing legal norms. There must be a new law formed which will govern this new field: the law of astronavigation and of satellites. It is generally recognized that air space is already under juridical control and is principally regulated by the Chicago Convention. Naturally, social juridical structure presently applicable to "air space" adjacent to the Earth cannot be adapted to outer space.

Before going into the law of satellites, we should determine precisely what is to be understood as a satellite. James Van Allen has said that from the scientific point of view the satellite is the product of natural evolution of rockets, which are products of natural evolution of airplanes and balloons, which in their turn, are the natural product of man, climbing trees and mountains to arrive at the top and therefore acquire a better view. From the juridical point of view the satellite is not an airplane. We believe that a satellite is defined by its characteristics, its orbital movement and therefore its gravitational navigation and its artificiality. On this premise any spaceship circling the Earth, even transitorially and obeying the laws of gravity should be considering a satellite.

No less important and urgent is the need to define the limits of space. Some writers have suggested that space could be divided into three zones subject to a distinct jurisdiction. The problem is not as simple as it appears, because, according to General Thomas D. White, atmosphere and space are blended into an "indivisible whole." The easiest problem to solve is that of defining the frontier between the second and third zones, that is, between the zone under international control and that of free navigation. The law of satellites logically would only govern as far as

the limits of terrestrial attraction which, according to Professor John C. Cooper, extends to some 251,000 kilometers in height and could well be set at 250,000 by convention. The line of demarcation between the first and second zones, that is, where airspace ends, is full of difficulties because all the old theories regarding the reach of arms, aerial espionage, etc., have been replaced by technological advancement. Professor Von Karman has probably made the most scientific attempt to trace the dividing line by placing it at a height of more or less 72,500 meters. Others set it at sixty-four kilometers, still others at eighty kilometers and 100 kilometers. Actually the technical frontier of the atmosphere appears to be around 100 to 400 kilometers, but at this time we know of no abrupt transition from one zone to the other. The juridical frontier will be only conventional, in the entire sense of the word, and its coincidence with the technical frontier cannot have more than an approximate value.

According to Andrew Haley the foundation of the laws relating to the reporting of the launchings of satellites emerged as a consequence of the series of agreements and exchanges arising out of the International Geophysical Year ended on December 31, 1958. It can be accepted that international cooperation has resulted in a reciprocal and tacit authorization to effect space research.

If outer space is under the same conditions as the high seas, the rest of the structure which will supply the law must be determined by international agreement, if the world is to live in peace. An international convention could set up the necessary norms and regulations or the nations of the world, through agreement, could grant to an international organism the power to set up norms which could be applied as law immediately. It may be desirable to request that all the nations of the world convene to regulate and organize outer space. President Franklin D. Roosevelt in the case of airspace called an international conference which resulted in the Chicago Convention and the International Civil Aviation Organization. This illustrious personage in an address to the delegates from fifty-two sovereign states convened in Chicago on November 1, 1944, said:

The rebuilding of peace means reopening the lines of communication and peaceful relationship. Air transport will be the first available means by which we can start to heal the wounds of war, and put the world once more on a peace-time basis.

He added that the fight for the freedom of the seas had been the direct result of various wars, not only in the Eastern but also in the Western Hemisphere:

We do not need to make that mistake again. I hope you will not dally with the thought of creating great blocs of closed air, thereby tracing in the sky the conditions of future wars. I know you will see to it that the air which God gave to everyone shall not become the means of domination over anyone.

Now we lack an organism which will consider all the juridical aspects of satellites and outer space exploration.

No less praiseworthy is the unobtrusive but productive and excellent work of a few private juridical and scientific institutions which are studying space law. Among them we should mention the purely juridical groups such as the International Law Association, the Association of American

Jurists, the Society of International Law, the American Rocket Society, the International Academy of Astronautics and the International Institute of Space Law.

The United Nations, on December 12, 1958 approved a resolution recognizing "the common interest of mankind in outer space and the common objective is to use it solely for peaceful ends." The same resolution created a space committee composed of certain member states to study various juridical problems. At the end of 1959, the United Nations convened to establish a permanent committee for the peaceful use of outer space. After the suborbital flight by Allan Shepard last year and the orbital flight of Lt. Col. John Glenn on February 20 of this year, the possibility of international cooperation in outer space was perceived. Both the Soviet Union and the United States reiterated their intent to cooperate in the exploration and probe of interplanetary space. On March 20 of this year the United Nations Committee for the Peaceful Use of Outer Space, composed of twenty-eight nations, convened for the first time and there was some hope of reaching agreements on cooperation in space.

There are many phases in the juridical regulation of satellites which need immediate legislation. For example, the fields of registration by nations, liability for damages occurring in foreign territory, regulation of boardings, the law of compensation, etc. require prompt action. There are many problems in this area. It would be desirable that all states cooperate and arrive at an international agreement such as the Antarctic Agreement signed in Washington in December of 1959. This resulted in an agreement with the Soviet Union on the exclusion of sovereignty, control and exchange of data. Such a convention should contain the declaration that in outer space there be no law of conquest nor occupation, but that it be open to everyone and used to encourage peace, scientific advancement and the welfare of mankind.

I believe that the initiative for calling such a world meeting for the juridical regulation of outer space will come from the New World, because America and her men are peace-loving. However, this Continent should contribute to the early salvation of spiritual conquests for it knows well that all might be lost with the conquest of space.