WORLD ADMINISTRATIVE RADIO CONFERENCE FOR PLANNING BROADCASTING SATELLITE SERVICE*

*Richard E. Butler***

The International Telecommunication Union (ITU) has worked closely with the Legal Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space during consideration of contributions to policy formulations and regulations as well as related treaty provisions which bind the 152 member governments in the ITU on space applications, including direct satellite broadcasting.

Although the ITU obligatory texts do not regulate direct broadcasting (television) content, the policy legislation and associated decisions determine the extent to which the transmission and reception of programs can, in fact, take place. These telecommunications elements of transmission, reception and the related conditions for sharing the radio frequency spectrum, and the interrelated planning and use of satellite orbits, are fundamental considerations in the intergovernmental decision-making role of the Union. They ensure orderly operation of all the telecommunication systems.

The regulatory policy conditions to be applied by governments and their authorities are elaborated and agreed in the Plenipotentiary and Administrative Conferences. The latter determine in detail the obligatory responsibilities and requirements to permit interference-free communications and optimal utilization of the spectrum/orbits.

With regard to radiocommunications, upon which all space applications depend, these conferences determine the obligations of all members with regard to the manner in which the radio spectrum and orbits (or, as now designated, the nominal orbit/spectrum because it is impossible to consider separately these two concepts) shall be planned, used and shared by the various services and the coordination procedures to be observed in order to avoid mutual interference.

The international decisions necessitate national (governmental) responsibilities and coordination and exchange of planning data sometimes directly on a bilateral basis, and/or alternatively through the headquarters of the Union—in this case principally the International Frequency Registration Board (IFRB). In any event, obligations to reach

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**Deputy Secretary General, International Telecommunication Union, Geneva, Switzerland. The views expressed in this paper are those of the author and are not necessarily connected with any organization of which he is a member.

agreement in very detailed planning and operations are prescribed in the statutory legislative provisions.

Although the ITU has an interest in the technical, legal and operational aspects of all items on the agenda of the Legal Sub-Committee, some specific comments should be made concerning direct satellite broadcasting, especially activity since the June 1976 Sub-Committee session. The major event in this context was the holding of the World Administrative Radio Conference for the Planning of the Broadcasting Satellite Service in the 12 GHz Band. This WARC Conference took place in Geneva from January 10 to February 13, 1977. The Final Acts were signed by the accredited representatives of 106 countries.[1]

The Final Acts are destined to be incorporated as an integral part of the Radio Regulations by the general World Administrative Radio Conference in 1979; thus,it can be said that the outcome of the conference is binding on all members.

In 1971, the World Administrative Radio Conference established the definition of the broadcasting satellite service and allocated suitable frequency bands. It laid down the principle of equal rights in the frequency bands for space radio communication services and stated that the international registration of frequency assignments did not provide permanent priority for any individual country or groups of countries. It also determined that stations in the broadcasting satellite service should be established and operated in accordance with agreements and associated plans adopted by competent world or regional conferences of the Union.

Subsequently, after consideration in the Plenipotentiary Conference (the supreme organ of the Union) it was decided that there should be a World Administrative Radio Conference for the planning of the Broadcasting-Satellite Service in frequency bands 11.7 - 12.2 GHz (in Regions 2 and 3) and 11.7 - 12.5 GHz (in Region 1); Regions 2 and 3 being the Americas and Asia, and Region 1 being Europe - East and West - and Africa. The agenda of the conference, determined by the Administrative Council in agreement with the members of the Union, is incorporated in the Final Acts.

The great complexity of the work which was before this conference should be noted. This was due to such factors as the need for the broadcasting-satellite service to share the bands with other radiocommunication services in order to economize the frequency spectrum and also to recognize that all countries may not wish to use the channels for direct satellite broadcasting (certainly not in the near future), but would wish to have their terrestrial services protected. It has been emphasized that the ITU was making a Plan for a service which was not yet in practical operation in these bands.

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[1]Final Acts of the World Administrative Radio Conference for the planning of the Broadcasting Satellite Service in Frequency Bands 11.7 - 12.2 GHz in Regions 2 & 3 and 11.7 - 12.5 GHz in Region 1 (Signed Geneva, Switzerland; February 13, 1977).

The Final Acts of the Broadcasting Satellite Conference have been designated as the World Agreement envisaged at the 1971 Conference. The resulting provisions cover both general and specific world-wide obligations, as well as detailed assignments which can only be used by the countries in accordance with the Plan to assure the desired quality of service to the service areas concerned. The complexity of the technical problems involved, which is evident from the agenda, explains why the planning of frequency assignments for the broadcasting-satellite service was made for these Regions 1 and 3; that is for the whole world with the exception of the Americas. The sharing criteria were established on very strict technical bases.

In the ITU Region 2 (Americas), the sharing conditions between the broadcasting-satellite service and fixed-satellite service (in other terms telecommunication satellites) are more complex. The Conference decided that the broadcasting-satellite assignment planning, as well as the necessary planning for the fixed-satellite service in Region 2, would be undertaken by a Regional Conference (convened in accordance with the provisions of the International Telecommunication Convention) no later than 1982. The results of that proposed Regional Conference will necessarily conform to the principles of the 1977 Conference and the Radio Regulations.

The planning itself, *i.e.*, the preparation of a table containing the parameters involved (frequency, nominal orbital positions, etc.) was only possible through the use of computers, which, since 1961, have become a common-place technique in the ITU in connection with planning conferences. Several computer runs for various purposes, including those used by individual delegations to assist their own internal decisions, were made.

The application of computers has made it possible to obtain optimum use of the geostationary orbit and of the frequency spectrum, in accordance with the provisions of Article 33 of the ITU Convention:[2]

> In using frequency bands for space radio services Members shall bear in mind that radio frequencies and the geostationary satellite orbit are limited natural resources, that they must be used efficiently and economically so that countries or groups of countries may have equitable access to both in conformity with the provisions of the Radio Regulations according to their needs and the technical facilities at their disposal.

The relevant provisions of the Radio Regulations[3] have also been taken into account, in particular the well-known No. 428A which states:

> In devising the characteristics of a space station in the broadcasting-satellite service, all technical means available shall be used to reduce, to the maximum extent

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[2]International Telecommunications Convention (Signed Malaga-Torremolinos, 1973), 23 U.S.T. 1527, T.I.A.S. No. 7935.

[3]Administrative Regulations (Radio Regulations), annexed to International Telecommunication Convention (1973), 23 U.S.T. 1527, T.I.A.S. No. 7935).

> practicable, the radiation over the territory of other countries unless an agreement has been previously reached with such countries.

Among all the provisions of the Radio Regulations, which of course apply to the stations foreseen in the Plan, mention should be made of provision No. 47OV, which is less well known than the previous one, but may have some bearing on the work of the Legal Sub-Committee. This provision concerns the cessation of emissions and states that:

> Space stations shall be fitted with devices to ensure immediate cessation of their radio emissions by telecommand, whenever such cessation is required under the provisions of these Regulations.

The planning assignments were made in accordance with the principle inherent in No. 428A. Spillover has been minimized by taking, as the reception spot(area) from each satellite antenna beam, an ellipse of the minimum size compatible with an acceptable service in the countries (or parts of countries in the case of large countries) concerned. In the majority of cases beams are intended for national or internal domestic zones of service. In a few cases beams provided for in the Plan are intended to cover nearby countries or parts of neighboring countries. Such assignments with their extra-territorial transmission coverage provided for in the Plan were inserted only when the countries concerned gave their consent.

As far as the ellipse intended for a certain country, or part of it, covers some regions of neighboring countries, it may be admitted that in these regions it could be possible, from the point of view of the available power flux-density, to receive the signals from the first country. In the first place, however, the television set used after the converter can only reproduce the program in this case, as in the case of terrestrial broadcasting, if the television standards are the same in both countries. Moreover, some significant additional elements contribute to limit the reception of the program concerned.

The use of different orbital positions would necessitate either the use of two different antennae or a resetting of the antenna which is unlikely in the case of the average user. It should be borne in mind that antennae would have to be fixed on external structures for each reception center and placed in line-of-sight of the nominal orbit position(s) of the satellites concerned. In the present state of the art, the antenna itself is a parabolic dish of some 80 cm in diameter. Thus (and particularly in the case of those countries which have agreed to different nominal orbital positions) actual reception would be extremely difficult. These are only some of the factors to be overcome to receive transmissions (i.e., programs) from other countries. To conclude this point, it may be said that, unless special provisions have been taken and agreed in the planning process, the reception of programs from neighboring countries in the present state of the art is far less easy in the case of the broadcasting-satellite service than in the case of terrestrial broadcasting.

In the Preamble of the Final Acts, the principle of equal rights of all countries, large and small, and even those countries which were not represented at the Conference, is specified. In fact, it was deemed essential at the very beginning of the Conference to take into account the potential needs of the countries not represented, taking as a basis needs similar to the average of the other countries.

The Final Acts were signed on February 13, 1977, and will enter into force on January 1, 1979. The provisions and associated Plan have been prepared to meet the present estimated needs of the broadcasting-satellite service in the bands concerned for a period of at least fifteen years from this date. They will continue in force until revised by a competent conference of the ITU.

The full text of the Final Acts reveals the depth of the detailed planning procedures and agreements reached in the Conference to achieve the objectives, including the statutory provisions already cited. The objectives, with their related inter-governmental agreement, were undoubtedly aided not merely by following the application of principles decided in the 1971 ITU Space Conference, to which there have been detailed references from time to time in the Legal Sub-Committee, but also by its work over the past years.

A broad aspect of the deliberations of the Conference was, to a certain extent, also related to the last point on the agenda of the Legal Sub-Committee, the definition of outer space. During the WARC debates some equatorial countries sought to establish recognition of national sovereignty over segments of the geostationary orbit, *i.e.*, those above internationally recognized territories. This view was not accepted by many other countries. In any event, it did not stop the Conference from establishing the necessary plans and associated obligatory principles and procedures for the planning and operation of services.

The equatorial countries concerned provided a statement in the Final Protocol indicating that they were not bound by the decisions of the Conference regarding the location of geostationary satellites on the segments of the orbit over which these States exercise sovereign rights, nor the positioning of such satellites requiring the prior authorization of the equatorial countries concerned. They would also reserve the right to take whatever steps they may deem fit to preserve and secure the observance of their rights. No claims were made on either side of the geostationary orbit or for other orbits.

Many other countries declared that the ITU Convention enabled the establishment of a Plan for the use of space, that there were no limitations in planning, and that there could be no question of sovereignty in space having regard to the Outer Space Treaty.[4] If the matter was to be considered further, it was one for consideration by the Legal Sub-

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[4]Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and other Celestial Bodies, January 27, 1967, [1967] 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (effective October 10, 1967).

Committee. Thus these countries rejected any concepts of sovereignty. Some of these provided various counter-declarations in the Final Protocol associated with the Final Acts.

In establishing a Plan, ITU membership always takes into account the relevant basic provisions of the Convention and associated regulations. Furthermore, when necessary, it also takes United Nations Resolutions into account.

A Plan[5] is to be considered as containing a collection of all the technical parameters necessary for the purpose of ensuring the optimum use of available resources. Among these parameters we can quote the frequency, the position, the power, the direction of the antenna beam and the beam width, etc. The position is always indicated in the Plan, whether it is on the earth or orbital. In the case of the geostationary orbit the term "nominal orbital position" is used. The indication of this nominal position means that the use of this part of an orbit for a transmitter is compatible with an operation of the system free of interference to or from other users. The mention of this position does not, from the ITU point of view, constitute an appropriation. This matter has been brought to the notice of the Legal Sub-Committee, in reporting the outcome of the work of the Conference, and no doubt the member countries concerned will ask for the appropriate consideration when the definition of outer space is taken up by the Sub-Committee.

As concerns the definition of outer space, the ITU has regulatory provisions defining, for example, "deep space" to meet the operational needs of particular radiocommunication users. In this regard, there may be interest in some information on suitable definitions governing the use of space telecommunications established for the international Radio Regulations. As a general remark, it can be said that these definitions relate more to the activity than to a precise delimitation of outer space. A "space station" is defined as "a station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the earth's atmosphere." It is clear that this definition covers the satellite before launching or during its re-entry into the atmosphere. "Space radiocommunication" is defined as "any radiocommunication involving the use of one or more space stations or the use of one or more passive satellites or other objects in space", and "terrestrial radiocommunication" has been defined as "any radiocommunication other than space radiocommunication or radioastronomy."

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[5]The Plan for the Broadcasting Satellite Service in the Frequency Bands 11.7 - 12.2 GHz in Regions 2 & 3 and 11.7 - 12.5 GHz in Region 1 (Geneva, Switzerland, 1977). The column headings of the Plan include: (1) *Country symbol and IFRB Serial Number* (Column 1 contains the symbol designating the country or the geographical area taken from Table No. 1 of the preface to the International Frequency List); (2) *Nominal Orbital Position,* in degrees; (3) *Channel Number;* (4) *Boresight* geographical coordinates, in degrees and tenths of a degree; (5) *Antenna beam width:* This column contains two figures corresponding to the major axis and minor axis respectively of the elliptical cross-section half-power beam, in degrees and tenths of a degree; (6) *Orientation of the ellipse* determined as follows: in a plane normal to the beam axis, the direction of a major axis of the ellipse is specified as the angle measured anti-clockwise from a line parallel to the equatorial plane to the major axis of the ellipse to the nearest degree; (7) *Polarization* (1 = direct, 2 = indirect); (8) *E.I.R.P.* in the direction of maximum radiation in dBW; and (9) Remarks.

It should be mentioned that terrestrial radiocommunication may involve ionospheric layers at an altitude between 500 and 1,000 km. This explains why the way in which space is defined in the ITU may be qualified as a "functional approach", to use the terminology adopted in some of the documents submitted to the Legal Sub-Committee on previous occasions.

The ITU continues its studies and regulatory policies inherent in the telecommunciation aspects of the other matters of current interest to the Legal Sub-Committee, that is, radiocommunications for lunar and remote sensing activities as well as the interface requirements for transmission and transfer of data from space research and space application activities. Comments on these mattes will be made by the ITU as they evolve in future deliberations of the Legal Sub-Committee.