

WARC-79: A brilliant success¹

At the end of eleven weeks of strenuous work,² the representatives of over 150 countries Members of the ITU adopted the new Radio Regulations which, in a volume of more than 1000 pages, will no doubt govern until the end of the century all services using the frequencies of the radio spectrum.

It has again been shown that, given goodwill and perseverance, the word impossible has no place in the ITU. And the vitality of the International Telecommunication Union, the soundness of its foundations and the effectiveness of its methods of work have once more been demonstrated.

It has in fact been proved that our Union, although 115 years old, knows how to adapt itself, today as in the past, to all new situations, whether technical, economic or political.

It has been proved that there is no problem, however difficult and complex it may be, which cannot be resolved, provided that everyone is animated by an unflinching determination, shows broad understanding and is imbued with a positive spirit of co-operation in the effort to arrive at a compromise solution which takes the interests of all parties into account.

In contrast to sterile confrontation, understanding and co-operation are the two key terms which have always prevailed in the ITU, and we are happy to note that they held good throughout the debates of the WARC.

Understanding and co-operation lead to the consensus which all conferences and meetings organized under the auspices of the ITU have consistently sought.

Thus, as soon as the Committees were established, the delegates set to work courageously in order to seek, in an atmosphere of serious application and cordiality, the reasonable compromises likely to command agreement among the great majority.

For 115 years, the ITU has applied these working methods successfully, and for a very long time they have proved effective.

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However, unlike the situation that existed not so long ago, it will be remembered that, at the opening of this Conference, nothing was comparable to what had gone before.

First, the problems to be solved were never so difficult nor so complex and the participants were never so numerous and of such diverse origin, training and viewpoint. What is more, many of them had never before taken part in an important ITU conference.

¹ WARC = World Administrative Conference. Address by Mr. Mili, Secretary-General of the ITU, at the closing meeting.

² The WARC opened on Monday 24 September and ended on Thursday 6 December 1979. See the brief report on the proceedings on pages 4-10 and extracts from the closing addresses given by Mr. Severini, Chairman of the Conference, and Mr. Jipguep, Vice-Chairman of the Conference and Chairman of the ITU Administrative Council.

³ In fact the Conference was scheduled to last for ten weeks but had to be prolonged for five more days.

I must therefore humbly confess that on the eve of the Conference I greatly feared that those features which constituted the originality and efficiency of our Union would be discarded in favour of certain much tougher, more intransigent methods.

Fortunately, these fears were rapidly dispelled, because from the very start the work followed the traditional practices of the ITU, again demonstrating the Union's strength and vitality.

We shall of course be told that the laws of physics are what they are and that no power, however great, can change them.

We shall also be told that badly framed regulations will harm the interests of all Members of the ITU without exception.

But there is the manner of approaching a problem and the strategy used to find a solution. That also is important. In 115 years, the ITU has developed its own working methods in a pragmatic manner. We are therefore glad to find that it is these methods that prevailed at the Conference.

So I have pleasure in repeating my most sincere congratulations on the exemplary fashion in which all participants accomplished their task within a space of time that many considered quite insufficient.³

First and foremost, I must congratulate the Chairman of the Conference, who guided the debates with courage, patience, understanding and full impartiality.

I would also congratulate the Vice-Chairmen of the Conference and the Chairmen and Vice-Chairmen of all Committees, without exception, on the expertise with which they carried a crushing task systematically forward to a successful conclusion.

I would commend particularly the 2000 or so delegates, all of whom showed rare competence, tireless energy and an impressive sense of responsibility.

The senior delegates of course, those who took part in the 1959 or even the 1947 Conference 32 years ago, have long acquired the habit of work well done. To them we owe a debt of gratitude.

But the new delegates, particularly those from countries which could not take part in the 1959 Conference, demonstrated their knowledge, enthusiasm and dynamism. By bringing a new approach, they introduced more spontaneity and thus contributed to the clarity of the debates. To all these delegates, I extend my warmest congratulations and hope to see them often at future ITU conferences.

In short, like all other ITU conferences, and perhaps even more so, the World Administrative Radio Conference of 1979 was a BRILLIANT SUCCESS.

M. MILI

Union Activities

World Administrative Radio Conference

AFTER 74 days of work (24 September-6 December 1979), the World Administrative Radio Conference (Geneva, 1979) convened by the Member countries of the International Telecommunication Union, which met under the chairmanship of Mr. Roberto J. P. Severini (Argentina), has completed its work and the delegations to WARC-79 have adopted and signed the new Radio Regulations which will come into force on 1 January 1982.

At the ceremony for the signing of the Final Acts, the Secretary-General of ITU, the Chairman of the Conference and the Chairman of the ITU Administrative Council addressed the meeting (for the text of the Secretary-General's speech, see our Editorial).

In his closing speech Mr. Severini, taking a look back at the 1959 Radio Conference and the results of the 1979 Conference, said:

"At that moment, well before their time, the space services were envisaged which today are a solid reality.

"Between 1959 and the present, the striking developments in space technology have slowly but surely justified those who took that action which I have no hesitation in proclaiming as visionary.

"This backward glance demonstrates the continuity of the activity of the International Telecommunication Union, a consideration which has been a deep source of reflection for me during my long term in the chair.

"So, as we can see now, it is future events which will be the stern judges of whether or not our predecessors were right.

"Fortunately, however, today we have again kept pace with the technological developments of this decade by devising new terms and procedures with regard to the frequencies which are not yet used, particularly in the space radiocommunication services."

Mr. Jean Jipguep, speaking in his capacity as Vice-Chairman of the Conference and Chairman of the ITU Administrative Council, said that the Conference had successfully finished its task after over ten weeks of intense activity. These weeks, however, paled "... into insignificance beside the months and even years devoted to the preparation of such a conference by Member countries and by Union headquarters.

.....

"Need I mention the efforts of the Union to co-ordinate these proposals in a document so voluminous that doubtless it scared younger delegates but did not for long deter the old hands from discerning the sensitive issues on which ideas would

differ at the Conference and on which they should sharpen their arguments.

"Need I also remind you of the preparatory seminars initiated by the Union which enabled the developing countries to realize what was at stake in WARC-79.

"Finally, need I recall the many meetings of the Administrative Council spent in preparing the agenda, organizing the technical and practical aspects and seeking and providing the ways and means to ensure the success of your Conference.

"As several delegations have emphasized, that preparation has borne fruit and the satisfaction of the delegations present bears witness to its quality."

I. Results of the Conference

The WARC-79 has adopted a large number of resolutions and recommendations relating to radiocommunications. The texts adopted cover a total of some 1150 pages.

The Conference, which was held in the International Conference Centre, Geneva (CICG), was attended by some 2000 delegates or observers from 142 Member countries of the ITU and 30 international organizations.

No less than 894 plenary meetings or meetings of committees and working groups were held, without counting the large number of smaller meetings.

The purpose of WARC-79 was the "overall" revision of the Regulations and the harmonization of the document as a whole. The new Regulations which will replace the existing ones represent, of course, a continuation rather than a dramatic break and the changes decided by the Conference for the various services will be carried out according to a timetable which takes account of the possibilities of the ITU Member countries, and, in particular, of the developing countries.



Signing of the Final Acts—Mr. Jipguep hands in the signatures of the Cameroon delegation

II. Agenda of the Conference

The agenda of WARC-79, laid down by the last ITU Plenipotentiary Conference (Malaga-Torremolinos, 1973), included the following items:

1. To review and, where necessary, revise the provisions of the Radio Regulations relating to terminology, the allocation of frequency bands and the directly associated regulations.
2. To review and, where necessary, revise the provisions applicable to the co-ordination, notification and recording of frequency assignments except those articles relating to a single service.
3. To review and, where necessary, revise the other articles applicable to more than one service.
4. To make any necessary consequential editorial amendments to other provisions of the Radio Regulations and the Additional Radio Regulations resulting from the action taken under agenda items 1, 2 and 3 above.
5. To review the report on the activity of the IFRB and revise, where necessary, the provisions relating to its methods of work and internal regulations.
6. To study the technical aspects for the use of radiocommunications for marking, identifying, locating and communicating with the means of medical transport protected under the 1949 Geneva Conventions and any additional instruments of these Conventions.
7. To take account of the resolution of the World Administrative Broadcasting-Satellite Radio Conference (Geneva, 1977) (WARC-BS-77) on the possible re-arrangement of the Radio Regulations and Additional Radio Regulations, to make such consequential changes as may be necessary to harmonize the Radio Regulations as well as the Additional Radio Regulations and to undertake any further necessary refinement and deletion of superfluous or redundant provisions.
8. To consider the proposals based on CCITT studies and to take appropriate decisions.
9. To consider the resolutions and the recommendations adopted by administrative radio conferences, to take such action as may be considered necessary and to adopt such new resolutions and recommendations as may be necessary.
10. To propose to the Administrative Council and to the next Plenipotentiary Conference a programme for convening future administrative radio conferences to deal with specific services.
11. To provide, for the benefit of future administrative radio conferences, such

guidelines as may be found necessary for optimum use of the frequency spectrum.

III. Structure of the Conference

The structure of the Conference, including the terms of reference of the Committees, was published in the *Telecommunication Journal*, November 1979, pages 662-663.

IV. Results of the Conference

In accordance with its agenda, the Conference revised the Radio Regulations.* It adopted resolutions and recommendations on the steps to be taken to implement the regulatory provisions or on studies to be undertaken with a view, for example, to establishing the technical bases for future conferences. The Conference also proposed a programme of administrative radio conferences for consideration by the Administrative Council and the Union's Plenipotentiary Conference.

The texts approved by WARC-79 constitute a revision of the provisions at present in force. While, therefore, they include a certain amount of new material, they also contain part of the existing provisions, which have been re-arranged and integrated in the new Regulations.** Furthermore, the texts of the WARC-BS-77, which contain a Plan for Regions 1 and 3, will in future constitute an appendix to the new Regulations. The Additional Radio Regulations, which dealt with questions relating to traffic and charges in the aeronautical mobile service and the maritime mobile service, have been deleted and the relevant provisions have been included either in the new Regulations, or in other official ITU documents.

The above considerations illustrate the permanent evolutionary process to which the international regulation of radiocommunications is subject.

Below we highlight some of the more important aspects of the work of the Conference.

1. Radio Regulations

The Radio Regulations constitute an annex to the International Telecommunication Convention, the inter-governmental treaty established by the ITU Plenipotentiary Conference which binds the Union Member countries.

* See December 1979 issue of the *Telecommunication Journal*, pages 720-722.

** The provisions of the existing Radio Regulations concerning specific services have been kept up to date between 1959 and 1979 by administrative conferences dealing with those services.

2. Revision of the Table of Frequency Allocations

The revision of the Table of Frequency Allocations (Article N7) was one of the most important tasks of the Conference, involving the re-allocation of the various frequency bands among the user services. Section V analyses the results obtained by the Conference. The analysis is purely informative and does not constitute an official document. It covers the frequencies between 9 kHz and 400 GHz.

3. Notification and entry in the Master International Frequency Register

The Conference revised the statutory procedures for the co-ordination, notification and entry of frequency assignments to radiocommunication stations in the Master International Frequency Register (Article N12).

With regard to the space services, it took into account the rapid development of those services since the last World Administrative Radio Conference for Space Telecommunications (Geneva, 1971) (WARC-ST-71).

With regard to the notification and registration of frequencies for the HF bands, it took account of the fact that many developing countries had become Members of the ITU since the last World Administrative Radio Conference in 1959. Many of those countries require special help in obtaining appropriate frequencies in the HF bands, in which there are already a large number of entries. The revised version of Article N12 provides those countries not only with a guarantee of being able to obtain frequencies in the HF bands for the fixed service, but also ensures that their services will be able to operate properly. This guarantee consists in the adoption of a procedure for the inclusion of frequencies in the Master International Frequency Register which will gradually be brought into force. This procedure, described in an annex to a resolution, will come into force on 1 January 1980. It will enable administrations to delete any entries that are no longer necessary and to classify the remaining entries according to whether they are for regular operational use, for use as a standby or for occasional use on a reserve basis.

4. Future radio conferences

Item 10 of the agenda required the Conference to propose to the Administrative Council and to the next Plenipotentiary Conference a programme for future administrative radio conferences to deal with specific services. The ITU Administrative Council is responsible for convening conferences and establishing their agendas in the light of requirements and the Union's budgetary possibilities, which are laid down by the

Plenipotentiary Conference (the next Plenipotentiary Conference will be held in Nairobi (Kenya) during the last quarter of 1982).

The Conference accordingly drew up a programme including a number of world and regional conferences, which are listed below:

A. World administrative radio conferences

- a) for the mobile services;
- b) for the planning of the HF bands allocated to the broadcasting service;
- c) on the use of the geostationary orbit and the planning of space services;
- d) for revising the Frequency Allotment Plan for the aeronautical mobile (OR) service (the aeronautical mobile service for non-scheduled lines);
- e) lastly, the Conference recommended that the Administrative Council should consider, from 1990, whether it is necessary to convene a world administrative radio conference for the general or partial revision of the Radio Regulations.

B. Regional administrative radio conferences

- a) first session of the MF Broadcasting Conference in Region 2 (already planned for March 1980);
- b) final session of the MF Broadcasting Conference for Region 2 (already planned for November 1981);
- c) Conference on the planning of the broadcasting-satellite service in Region 2 (already planned for the second quarter of 1983);
- d) Conference on the planning of sound broadcasting in the band 87.5-108 MHz for Region 1 and certain countries in Region 3;
- e) Conference for the conclusion of agreements and drawing up of the associated plans for feeder links to broadcasting satellites in the 12 GHz band, in accordance with the Plan adopted by the WARC-BS-77 for Regions 1 and 3;
- f) Conference on the revision of the 1948 Copenhagen Plan and Convention for the European maritime area, Region 1;
- g) Conference on the re-examination and revision of the provisions of the Final Acts⁵ of the African VHF/UHF Broadcasting Conference (Geneva, 1963);
- h) Conference on the preparation of a broadcasting Plan in the band 1605-1705 kHz in Region 2;

- i) Conference on the definition of sharing criteria for the use of the VHF and UHF bands allocated to the fixed, broadcasting and mobile services in Region 3.

5. International technical co-operation in the field of radiocommunications

The Conference adopted a number of resolutions and recommendations on international technical co-operation and assistance to developing countries which provide for measures aiding those countries in the following sectors:

- application of the Radio Regulations (publication of a handbook);
- national radio frequency spectrum management (organization of symposia for staff training, introduction of data-processing techniques, supply —on request—of technical information and data to facilitate the choice of suitable frequencies);
- network operation (assistance to facilitate the access of the fixed services in developing countries to the HF bands, international co-operation and assistance in space radiocommunications, propagation studies in tropical regions);
- development of rural and maritime telecommunications;
- preparation of specifications for low-cost television receivers;
- transfer of telecommunication technology with a view to improving telecommunication services of all kinds (intensified technical co-operation activities, the finding of the necessary financing at the international level).

V. Changes to the Table of Frequency Allocations

A—9 to 4 000 kHz

- 1. First, it should be noted that the lower limit of the Table of Frequency Allocations has been moved from 10 to 9 kHz.
- 2. The time signals have been added in all bands allocated exclusively to the standard frequency service.
- 3. The band 90-110 kHz has been reserved for the use of the radionavigation service world-wide. This band is protected by a footnote from interference from emissions in adjacent bands. A footnote has also been added to improve the use of the band through co-ordination of the technical characteristics and of operation of the system used.

4. In Region 1, between 150 and 285 kHz, the allocation to the broadcasting service has been improved by restricting the allocations to the aeronautical radionavigation service. The band limits have been altered from 150-285 kHz to 148.5-283.5 kHz to permit the change of frequency of all broadcasting stations so that carriers will be multiples of the channel separation (9 kHz). A resolution has been adopted providing that the frequency changes shall take place over a period of 4 years from 1 February 1986 to ensure minimum possible interference to aeronautical radionavigation service in Regions 2 and 3.

5. It should also be noted that the band 190-200 kHz has been reserved exclusively for aeronautical radionavigation in Regions 2 and 3.

6. Between 285 and 435 kHz, in Region 1, an appreciable improvement has been made in the status of aeronautical radionavigation to compensate for the restrictions imposed below 285 kHz.

7. The guard band of the frequency 500 kHz has been reduced from 490-510 to 495-505 kHz. A resolution has been adopted inviting the next mobile services conference to decide on the date of entry into force of the new guard band of frequency 500 kHz. Another resolution has been adopted providing that the use of the bands between 435 and 526.5 kHz by the maritime mobile service in Region 1 shall be regulated by a plan to be prepared at that conference.

8. The limits of the bands used by the broadcasting service in Regions 1 and 3 have been changed from 525 and 1 605 kHz to 526.5 and 1 606.5 kHz respectively. In addition, the power which can be used by broadcasting stations in Region 2 in the band 525-535 kHz has been increased. Also in Region 2, the allocation for broadcasting has been extended to 1 705 kHz. The use of the new band 1 605-1 705 kHz will be regulated by a plan to be prepared by a regional administrative conference which should be held not later than 1985.

9. It will be seen that, above 1 606.5 kHz, allocations to the maritime mobile service have been improved in Region 1; this service is the only primary service in a number of bands, so that it is possible to plan them. The bands in question are: 1 606.5-1 625 kHz, 1 635-1 800 kHz and 2 045-2 160 kHz. Also for a number of countries in Region 1, the maritime mobile service's status as the single primary service has been extended by means of a footnote to the bands 2 194-2 300 kHz and 3 155-3 200 kHz. The use of these bands by the maritime mobile service will also be the subject of a plan to be drawn up by the next mobile services conference.

10. It can also be seen that three bands have been exclusively allocated to radiolocation in Region 1 (1625-1635 kHz, 1800-1810 kHz and 2160-2170 kHz). The use of these bands by the radiolocation service is also subject to coordination between users and to a limitation on power.

11. It should be noted further that, in Region 2, the LORAN system up to 2000 kHz will be eliminated by 31 December 1982 at the latest.

12. A new band has been allocated exclusively to the amateur services between 1810 and 1850 kHz in Region 1 and between 1800-1850 kHz in Region 2.

13. The Conference has adopted provisions for the transfer of frequency assignments to stations in the fixed and mobile services operating in the bands which have been allocated exclusively to the radiolocation and amateur services in Region 1. These bands may be used by those services only after the transfer has been satisfactorily concluded.

So far as the maritime mobile service is concerned, the transfer will be carried out in accordance with the plan referred to in paragraph 9.

14. In Region 2, it should be noted that, to compensate for the bands that have been allocated to the broadcasting service above 1605 kHz, the status of the radiolocation service has been improved in the upper part of the 1605-2000 kHz band.

15. Taking into account the fact that the 1967 Maritime Conference reduced the guard band of frequency 2182 kHz, the Conference has allocated the two bands which remain after this reduction to the maritime mobile service. The Conference has also adopted a resolution requesting the next mobile services conference to study the possibility of reducing this guard band even further and to adopt provisions for the use of the two bands which have been allocated to the maritime mobile service.

16. The Conference added a footnote to the Table of Frequency Allocations which will reserve a common world-wide channel between 3155 and 3195 kHz for wireless hearing aids. Further channels may be assigned between 3155 and 3400 kHz.

17. A new footnote was also added to the Table of Frequency Allocations covering the use of bands allocated to the amateur service in the event of a natural disaster. The amateur service was given an exclusive allocation between 3500 and 3750 kHz in Region 2.

18. Another new footnote was added on the use of the band 3995-4005 kHz for the transmission of standard frequencies and time signals (also in the bands around

8 and 16 MHz). On the other hand, proposed footnote for the designations of the frequency 3390 kHz for ISM applications was not accepted by Working Group 5BA.

19. The Conference adopted a recommendation that the next mobile services conference should consider the possibility of allocating a frequency between 435 and 535 kHz for world-wide use for the transmission of notices to shipping and meteorological and navigational warning by narrow band direct printing telegraphy.

20. In conclusion, it can be said that the Table of Frequency Allocations between 9 and 4000 kHz has not undergone major change, but that, particularly in Regions 1 and 2, an effort has been made to improve the conditions for sharing by the radiolocation, aeronautical radionavigation and maritime mobile services. An attempt has also been made to extend the bands used by the broadcasting and amateur services. It may be noted that at this Conference the regional character of the use of the bands below 4000 kHz was confirmed.

B—4 000 to 27 500 kHz

1. Fixed services (4 000-10 000 kHz)

1.1 In response to the well presented desire of many countries to continue to use the high frequency fixed services, mainly for internal national communication systems, very few changes to the allocations to the fixed service have been made below 10 000 kHz.

1.2 One significant reallocation was made from the fixed service to the broadcasting service in the band 9 775-9 900 kHz. The availability of this band to the broadcasting service is dependent upon the satisfactory transfer of existing fixed services, in accordance with the provisions of footnote 3510A. This is referred to further in connection with the reallocated frequency bands above 10 000 kHz as described in paragraphs 3 and 4 below.

1.3 Other changes involve increased sharing between the fixed service and the maritime and land mobile services.

1.4 In particular the maritime mobile service has been added on an equal primary basis with the fixed service in the band 4 000-4 063 kHz and on a primary basis with the same service in the band 8 100-8 195 kHz.

1.5 Fixed service sharing has been established in Region 2 with the mobile, except aeronautical mobile, service on a primary basis and in Region 3 with the land mobile service on a secondary basis in the band 4 750-4 850 kHz.

1.6 In the band 5060-5 250 kHz the mobile, except aeronautical mobile, service has

been included on a secondary basis with the fixed service as primary service. In the band 5 250-5 450 kHz the allocation to the land mobile service has been extended to the mobile, except aeronautical mobile, service on an equal primary basis with the fixed service. A primary allocation for the land mobile service has been made in the band 5 730-5 950 kHz in Region 1 and a secondary allocation for the same service has been included in the bands 6 765-7 000 kHz and 7 300-8 100 kHz in the three Regions, all with the fixed service as a primary service. Also in the band 5 730-5 950 kHz a primary allocation has been made in Region 2 to the mobile, except aeronautical mobile, service and a secondary allocation has been made to the same service in Region 3.

1.7 In summary, of the fixed service spectrum between 4 000 and 10 000 kHz, 125 kHz has been reallocated and increased sharing has been provided on a primary basis in 578 kHz in Region 1, 678 kHz in Region 2 and 358 kHz in Region 3. Sharing by other services on a secondary basis has been provided in 1 225 kHz in Regions 1 and 2 and 1 545 kHz in Region 3.

2. Fixed services (10 000-27 500 kHz)

In the bands between 10 000 and 27 500 kHz significant reallocations of spectrum from the fixed bands were made in favour of the maritime mobile, the broadcasting and the amateur services. However, the band 21 850-21 870 kHz which will be vacated by the radioastronomy service has been reallocated to the fixed service.

3. Maritime mobile service

Additional spectrum for the maritime mobile service was provided for in the bands 12 230-12 330 kHz, 16 360-16 460 kHz, 17 360-17 410 kHz, 18 780-18 900 kHz, 19 680-19 800 kHz, 22 720-22 855 kHz, 25 110-25 210 kHz and 26 100-26 175 kHz. These reallocations, which total 800 kHz, will be available under the conditions specified in footnote 3511A, which provides for the transfer of the existing services operating in these bands in accordance with the Table of Frequency Allocations and which are recorded in the Master Register. The Conference also approved the detailed procedures and the time scale for effecting the transfer of the fixed service assignments. For the bands above 10 000 kHz the transfer period is to be 5 years from 1 July 1984.

4. Broadcasting service

The broadcasting service bands have been augmented under conditions that are similar to those governing the transfer of bands to the maritime mobile service. A total of 725 kHz of spectrum is to become available to the broadcasting service in the bands 11 650-11 700 kHz, 11 975-12 050 kHz, 13 600-13 800 kHz,

15 450-15 600 kHz, 17 550-17 700 kHz and 21 750-21 850 kHz. Footnote 3510A sets out the conditions under which the above bands may be used by the broadcasting service. This footnote also refers to the band 9 775-9 900 kHz reallocated to the broadcasting service below 10 000 kHz.

The same transfer time period mentioned in connection with the maritime mobile service applies also to the broadcasting service. For the band below 10 000 kHz the transfer period is to be 10 years from 1 July 1984.

5. Amateur service

The amateur service has been allocated additional bands at 10 100-10 150 kHz on a secondary basis, 18 068-18 168 kHz including amateur satellite on an exclusive basis and at 24 890-24 990 kHz also including amateur satellite on an exclusive basis. The availability of the latter two bands to the amateur service is dependent upon the completion of the satisfactory transfer of all assignments operating in these bands and recorded in the Master Register.

6. Footnotes

A feature of the high frequency allocation table, in comparison with other parts of the Table of Frequency Allocations, is the few footnotes giving alternative or additional allocations to individual countries or to groups of countries. In general those footnotes which have been included for individual countries limit the use of the allocation to services operating within the countries concerned. Other footnotes have been added to allow administrations to use certain bands on a non-interference basis within their territories.

7. Standard frequency and time signals

Discrete table entries have been made for the standard frequency and time signal services at 5 000, 10 000, 15 000, 20 000 and 25 000 kHz. Footnote entries have also been made for the transmission of standard frequency and time signals by stations in Region 3 at 8 000 and at 16 000 kHz.

8. Industrial scientific and medical applications (ISM)

A new provision for ISM applications has been made at 6 780 kHz, and the existing provisions at 13 560 and at 27 120 kHz have been maintained.

9. Aeronautical mobile services

The existing exclusive allocations for the aeronautical (R) service have been maintained and the recommendation of the World Administrative Radio Conference on the Aeronautical Mobile (R) Service (Geneva, 1978) to include the

band 21 924-22 000 kHz exclusively for the aeronautical mobile (R) service has been adopted. The exclusive provisions for the aeronautical mobile (OR) service have also been maintained.

10. Radioastronomy service

The existing primary allocation to the radioastronomy service in the band 13 360-13 410 kHz on a shared basis with the fixed service has been maintained. On the other hand, the band 21 850-21 870 kHz will be vacated by the radioastronomy service which has received a new exclusive allocation in the band 25 550-25 670 kHz. The availability of this band is dependent upon the completion of the satisfactory transfer of all assignments to fixed and mobile stations in the lower part of the band (25 550-25 600 kHz) and of the transfer of the broadcasting stations operating in the upper part (25 600-25 670 kHz) to frequencies in accordance with the new broadcasting Plan to be established in the future Broadcasting Conference.

C—27.5 to 960 MHz

1. Major changes to the Table of Frequency Allocations were made as follows:

- the allocation to the broadcasting service in the band 41-47 MHz in Region 1 was deleted in favour of fixed and mobile services;
- the guard band for the aeronautical marker beacons at 75 MHz was harmonized to ± 200 kHz world-wide;
- the allocation to the aeronautical radionavigation service in Region 3 in the band 78-80 MHz was suppressed;
- the allocation to the broadcasting service between 100-108 MHz is now world-wide with several footnotes, which provide transfer dates for existing stations of other services in Region 1;
- the band 136-137 MHz is allocated to the aeronautical mobile (R) service on a primary basis as from 1 January 1990;
- the maritime mobile distress and calling frequency 156.8 MHz has been introduced with appropriate guard bands into the Table as a world-wide allocation;

— the allocation to the broadcasting service has been extended in Region 1 on an exclusive basis and in Region 3 on a shared basis to 174-223 MHz and on a shared basis in both Regions up to 230 MHz; in the same band in Region 2, the mobile service allocation between 216-220 MHz is restricted to the maritime mobile service, the radiolocation service being downgraded to secondary status;

— radioastronomy service has been introduced with primary status in the band 322-328.6 MHz;

— the primary allocations to the fixed and mobile, except aeronautical mobile, services in the bands 420-430 MHz and 440-450 MHz have been extended from Region 1 to world-wide, while downgrading the radiolocation service in Regions 2 and 3 to secondary status;

— in Region 1, the allocation to the broadcasting service on an exclusive basis has been broadened to 470-790 MHz and on a shared basis up to 862 MHz. Above 862 MHz, the allocation to the broadcasting service in Region 1 is restricted to the African broadcasting area;

— in Region 2, apart from a primary allocation to radioastronomy service between 608-614 MHz, the fixed and mobile services obtained secondary or even primary allocations between 470 and 960 MHz;

— in Region 3, the primary allocations to the fixed, mobile and broadcasting services have been extended to cover also 585-610 MHz.

2. Apart from the changes to the Table of Frequency Allocations, major changes were introduced by footnotes, these however being restricted to a varying number of countries to satisfy special requirements.

3. Furthermore, a resolution has been adopted, relating to the convening of a planning conference for sound broadcasting in the band 87.5-108 MHz for Region 1 and certain countries concerned in Region 3. In two recommendations, the CCIR is requested to study the compatibility between the broadcasting service and the aeronautical radionavigation service at 108 MHz and to study aspects of an automated VHF maritime mobile communication system.

4. The results of the work in Working Group 5C could not completely satisfy all divergent requirements. They should be considered as a compromise solution to different problems in different areas of the world. It will be up to future conferences to adapt the Regulations to cover changed requirements.

D—960 MHz to 40 GHz

1. General

From a consideration of all the proposals referred to the frequency band 960 MHz to 40 GHz as well as the discussions thereof, one could in general make the following observations:

— the thrust of one kind of the proposals was for acquiring more and more frequency bands for terrestrial ser-

VICES with the majority of the requirements of these proposals for fixed-satellite service being limited to below 10 GHz;

- whereas the thrust of the other kind of proposals has been, while calling for adequate protection to all the systems operating below 10 GHz, to ask for increased allocations in higher frequency bands for advanced applications and services such as passive sensing, active sensing, space research, etc.;
- the need for making a provision for new services such as satellite sound broadcasting and transmission of electric power using satellites.

2. Specific subjects

The following subjects of a more specific nature may be noted:

- increased bandwidth amounting to about 600 MHz has been provided for the fixed-satellite service in the band below 10 GHz;
 - matching up-link allocations have been provided by adequately extending the up-link allocations by as much as 225 MHz below 10 GHz band;
 - in the frequency bands below 20 GHz an increase of 500 MHz for both up-links and down-links for the fixed-satellite service has been allocated to meet the increasing needs of the future;
 - adequate up-links provision has been made in order to provide for the feeder links to the broadcasting-satellite service, to match the down-link allocations as planned in WARC-BS-77 for Regions 1 and 3;
 - allocations have been made to provide for both the fixed-satellite and broadcasting-satellite services in Region 2 and necessary up-links have also been identified to help them in planning the up and down-link allocations to all the countries in Region 2;
 - agreements have been reached to develop and take into account the interregional sharing criteria during the Region 2 Conference to ensure not to affect the Regions 1 and 3 Plans;
 - also increased frequency band is provided for Region 3 countries in the 12 GHz band for the inclusion of the broadcasting-satellite and fixed-satellite services;
 - the needs of the maritime mobile-satellite as well as the aeronautical-mobile satellite services have been adequately provided for; as a result, these systems could develop without any hindrance;
- also, in principle, it is agreed to provide for the feeder links to these services in the bands allocated to the fixed-satellite service in the bands below 10 GHz;
 - mobile-satellite service has been introduced and adequate provision of frequency bands has been made for this service;
 - realising the importance of inter-satellite service adequate provision has been made for this service;
 - amongst the passive services one could say that the radioastronomy service has received its due consideration in several parts of the frequency spectrum between 1 and 40 GHz;
 - passive sensing in the Earth exploration-satellite and space research services having been identified as subjects of utmost importance in the future, adequate provision has been made for these services. Further, in some parts of the spectrum where the fixed and mobile (except aeronautical mobile) services operate under a footnote provision, important agreements have been reached either to limit or phase out the fixed and mobile services over a period of time with the intention of providing exclusive bands for the passive services;
 - significant increases have been made to the spectrum allocated to the Earth exploration-satellite and the space research services. In addition provision has been made for the operation of radars on board spacecraft in these services;
 - extensive allocations have been made jointly to the amateur satellite and the amateur services both on an exclusive as well as on a shared basis with other services;
 - the concept of observing intentional emissions from extra-terrestrial sources has been accepted and frequency bands are identified where these observations are likely to be made;
 - recognizing the importance of the satellite sound broadcasting and solar power satellites, resolutions or recommendations as appropriate have been included for further studies;
 - also a number of problems have been identified that need further study.

E—40 to 400 GHz

1. General

Three points of a general nature might be made:

1.1 Due account had to be taken of the effects on allocations of the absorption bands related to the atmospheric consti-

tuents—oxygen and water vapour. While these would result in restrictions on the use of spectrum for certain types of service (e.g. Earth-to-space links) in the bands concerned, they could also be exploited to advantage in other cases (e.g. isolation between space and surface or near-surface systems, and frequency re-use for the latter class of systems).

1.2 The aim was to take a middle-of-the-road approach between the two extreme approaches of:

- a) avoiding sharing restrictions by allocating spectrum on either an exclusive basis or to a very limited number of services, on the ground that there is a great deal of spectrum available;
- b) allocating a band to so many services, even though they could be shown to be in some measure compatible in principle, that a high level of restriction in sharing would result and thus potential users would be somewhat discouraged from investing in the development or the purchase of equipment for utilization of the spectrum.

1.3 It was recognized that the time frames within which the various services would be found to be exploiting the spectrum well above 40 GHz would vary over a wide range. On the one hand, there is already some significant level of activity in areas such as radioastronomy and Earth exploration; on the other hand, it might well be some time before operational space systems evolve in areas such as broadcasting and radionavigation. However, there is broad opinion that initiative in the form of allocations to services is required to act as stimulus and guidance for research and development.

2. Specific subjects

The following subjects of a more specific nature may be noted:

2.1 The need for spectrum for feeder links to broadcasting satellites has been taken into account in allocations to the fixed-satellite service. In the 40 GHz region, a band has been identified by a footnote although not reserved exclusively and the potential need for the broadcasting-satellite application has been underlined.

In the same way, additional spectrum has been allocated to the fixed-satellite service in the Earth-to-space direction near 100 GHz, keeping in mind the allocation to the broadcasting-satellite service in the band 84-86 GHz.

2.2 Allocations of additional spectrum have been made to the radioastronomy service. These have recognized, in each case, the nature of the observations (i.e. of spectral lines or of the continuum).

2.3 Allocations have been made to a variety of terrestrial services (allocations above 40 GHz were confined previously to the space services and to radio-astronomy).

In the case of certain combinations of space and terrestrial services, it was concluded that there was inadequate information on sharing. Footnotes were therefore added to reflect this uncertainty, and the subjects were referred to the CCIR for further study.

2.4 A number of bands in the frequency range 275-400 GHz have been identified as being of special importance for the passive services (i.e. radioastronomy, Earth exploration-satellite (passive) and space research (passive)), and a footnote to that effect has been added as emphasis.

2.5 Significant increases have been made to the spectrum allocated to the Earth exploration-satellite and the space research services for the operation of passive sensors. In addition, provision has been made for the operation of radars on board spacecraft in the above two services.

2.6 Extensive allocations have been made jointly to the amateur-satellite and the amateur services, both on an exclusive basis and on the basis of sharing with other services and with a secondary status. In the latter case the allocations are contiguous with the former.

2.7 Three new bands have been designated for ISM applications. Two significant factors in the allocations are that the bands are in harmonic relationship and that the use of the bands is subject to special authorization by the administration concerned in agreement with other administrations whose radiocommunication services might be affected.

2.8 The pattern of allocations to the inter-satellite and the fixed-satellite services follows, in general, that laid down by the WARC-ST-71, i.e. with the former concentrated in the absorption bands so as to take advantage of the atmospheric attenuation to provide shielding between the space and the surface (or low-altitude) systems, and the latter located in spectrum between the absorption bands.

2.9 Radiolocation allocations have been made in two distinct groups—in the absorption bands for shorter range systems with a high potential for frequency re-use, and in the radio windows between those bands for longer-range systems.

2.10 The group of allocations to the aeronautical and maritime mobile- and radionavigation-satellite services has been generalized somewhat in terms of the addition of the corresponding terrestrial services.