CANADA

DEPARTMENT OF COMMUNICATIONS

OTTAWA

REPORT OF THE CANADIAN DELEGATION TO THE ITU WORLD ADMINISTRATIVE RADIO CONFERENCE FOR SPACE TELECOMMUNICATIONS AND RADIO ASTRONOMY

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INTRODUCTION

I GENERAL

The second World Administrative Radio Conference was convened in Geneva on June 7, 1971. The Conference was attended by one hundred member countries, seven specialized agencies and twenty-six international organizations making up approximately seven hundred and fifty participants.

The main results of the Conference have been the revised administrative and technical regulations, including the technical sharing criteria, and the allocation of new frequency bands to the Space and Radioastronomy services. The following comments summarize the main highlights of the decisions which have the most significant impact on spectrum management. Later on in the report detailed comments are given on the revised regulations insofar as they affect each Space Radiocommunication service.

II ADMINISTRATIVE REGULATIONS

In relation to frequency notification and registration, the Conference adopted an advance publication procedure which requires that information on new space systems be submitted to the IFRB for publication in the weekly circular during the period 2 to 5 years before the in-service date. As a result of this procedure it will be necessary for the Department to review and to revise the DOC licensing procedures, including the relevant Radio Standards Procedures. It will also be necessary to ensure that the timing and the amount of information submitted to the Department is adequate to allow the Department to comply with the ITU Regulations. As a result of some of the changes to Articles 9 and 9A, the Department must review the internal procedures with respect to notification of terrestrial and space systems to the IFRB.

III BROADCASTING SATELLITE PLANNING CONFERENCE

The Conference agreed to Resolution No. SPA F whereby it is resolved that stations in the Broadcasting-Satellite service shall be established and operated in accordance with agreements and associated plans adopted by world or regional administrative conferences. The Administrative Council of the ITU is asked to examine in the near future the possible timing for such world and/or regional administrative conferences. In view of the acceptance of the principle of developing plans for the Broadcasting-Satellite service, it will be necessary for Canada to undertake sufficient studies to determine what our requirements might be. It will also be necessary to give consideration to the possible agenda items and dates for world and/or regional Broadcasting-Satellite administrative conferences.

IV TECHNICAL SHARING CRITERIA

The Conference adopted much more extensive and detailed sharing criteria applicable to bands shared equally between the Terrestrial and Space services. As a result of these revised sharing criteria the Department will be revising its domestic technical standards to ensure consistency with the ITU provisions.

V CO-ORDINATION PROCEDURE

The new co-ordination procedure for sharing between Terrestrial and Space services is essentially the procedure adopted by the CCIR Special Joint Meeting of February 1971. As a result of this new co-ordination procedure, which is now a part of the Regulations, it will be necessary for the Department to very carefully review this procedure and adapt our domestic procedures to it, as required.

VI FREQUENCY ALLOCATIONS

The main consideration of the Department in this area will be to review the revised allocations of the ITU and to determine how these are to be used in Canada. In a number of cases where the ITU has allocated frequency bands to several services on an equal primary basis, it is envisaged that in Canada we may wish to restrict the domestic allocation to one or two of these services. Therefore, the DOC will have to undertake a detailed review of Canadian requirements, in the context of these new allocations, in consultation with all concerned.

In the revised Article 5 of the Regulations there are a number of frequency allocations which will have some impact on spectrum management in Canada. The first one of these concerns the Maritime-Satellite service which has been allocated two 100 kHz channels at 157 and 162 MHz for safety and distress purposes. Implementation of the use of these channels may not commence prior to 1 January 1976 and it has been left to the 1974 Maritime WARC to determine if and to what extent these channels shall be used. Sharing between the Maritime-Satellite service and the terrestrial services such as the Land-Mobile service would be difficult; therefore, Canada should carefully determine which channels within the bands specified in footnote 287A would cause the least hardship to its domestic systems. If all of the above channels were utilized by Maritime-Satellite service, it may be necessary that the terrestrial services vacate portions of these bands in certain parts of Canada.

The Conference has provided for the use of the band 620-790 MHz by the Broadcasting-Satellite service. Canada should examine very closely, as stated earlier,any foreseeable Canadian requirement for the Broadcasting-Satellite service in this portion of the spectrum, and if so, we should recognize that sharing between the Broadcasting-Satellite service and the terrestrial services is not necessarily feasible in the same geographical area.

With respect to the Canadian proposal at about 1400 MHz for thin-route satellite systems, for which there was strong opposition, the Conference adopted a 35 MHz down-band allocation (2500-2535 MHz) and an up-band allocation (2655-2690 MHz) which are at the extremities of the 2500-2690 MHz allocation for Broadcasting-Satellites. This band is also allocated to Fixed and Mobile and, in Canada, the 2500-2550 MHz portion is used by Radiolocation services and portions of the remainder by Instructional television systems. Because of certain sharing problems, Canada will have to plan the use of this band carefully, in the light of existing usage and future requirements.

Footnote 392AA provides for the use of the band 6625-7125 MHz by Fixed-Satellite services (Space-to-Earth) on a secondary basis, in Brazil, Canada and the U.S., subject to coordination among those concerned and affected. This was a compromise for the original U.S. proposal for a world-wide allocation on an equal primary basis, which Canada and others opposed. The possibility of these additional frequencies could alleviate spectral and orbital congestion, although terrestrial service requirements will also have to be taken into account.

The frequency allocations between 10 and 15 GHz do not represent a particularly neat arrangement but it was the only solution that met the stated requirements of all Region 2 countries. In spite of the complex allocations it is still possible for Canada to continue its development and operation of digital radio systems in the 10.7 to 11.7 GHz and 12.2 to 13.25 GHz bands. Some portions of these bands are also allocated to the Fixed-Satellite Service on an equally shared basis. Since such sharing implies geographical separation between earth stations and terrestrial systems, the use of these bands by domestic Fixed-satellite systems could place restrictions on both services in the many urban areas which they both could serve; the use by international Fixed-satellite systems would reduce the number of such areas. The band 11.7 to 12.2 GHz is restricted to domestic space systems. However, the allocation includes space and terrestrial services which cannot operate without interference within the same geographical area; this, we pointed out at the Conference, to no avail; fortunately, a footnote prevents the introduction of terrestrial services until such time as planning has been completed for the space services. In any event, these multiple allocations will require careful planning and coordinated usage, both domestically and internationally.

Above 13.25 GHz, a number of new allocations have been made to the Space and Radio Astronomy services. As these portions of the spectrum are not in use in Canada at this time, nor are there specific plans to do so in the near future, these allocations do not require the same urgent consideration as the other bands mentioned. They do, however, provide opportunities for satisfying future telecommunications requirements.

DEFINITIONS

The Conference adopted new and revised definitions for the Space Radiocommunication services and these terms are included in the report for each service. A comparison between new and existing service terms is also included on the last page of this report.

CONCLUSION

The Canadian delegation to this Conference is generally satisfied that Canadian radiocommunication needs have been adequately provided for and that the interests of Canadian users of the spectrum have been safeguarded. Although all of the proposals put forth by Canada were not adopted in their original form, the resulting provisions do satisfy the original intent. In all cases, the need for careful implementation planning is pressing.

The Department would like to take this opportunity to express its appreciation to all of the Government departments and agencies and to the industrial organizations and other non-government associations and agencies, and to all their representatives, who so kindly gave their assistance in the extensive preparation for this Conference.

FIXED-SATELLITE SERVICE

1.0 GENERAL

Below 10 GHz there were very few new allocations to this service. Above 10 GHz a total of 40.75 GHz has been allocated to the Fixed-Satellite service with 35.0 GHz allocated on an exclusive basis. Between 10 GHz and 40 GHz 8.75 GHz has been allocated to the Fixed-Satellite service with 3 GHz of this being allocated on an exclusive basis. The Canadian objective was to have much more spectrum allocated to the Fixed-Satellite service on an exclusive basis, particularly in the bands 10-40 GHz. It is now considered that sharing between space service and terrestrial services is easier at these higher frequencies; therefore, the Conference accepted sharing between space and terrestrial services.

Canada had submitted proposals for allocations to this service for thin route systems in the 1500 MHz band but these proposals did not have much support; therefore, at the Conference we developed alternate proposals in the 2500 MHz band which were ultimately accepted.

In the 11.7 to 12.2 GHz band Canada and the U.S. were hoping for exclusive allocations to the space services in Region 2, but due to opposition from the Latin-American countries we were not able to have these proposals accepted. This band is now shared on an equal primary basis between space and terrestrial services, although eventual use is subject to Regional planning for the space services.

2.0 DEFINITIONS

This service is a newly named service and replaces the previous communication-satellite service. The definition of the service has also been changed as follows:

a) Former definition of the Communication-Satellite Service

"A space service

--between earth stations when using active or passive satellites for the exchange of communications of the fixed or mobile service, or

--between an earth station and stations on active satellites for the exchange of communications of the mobile service, with a view to their retransmission to or from stations in the mobile service."

b) New definition of the Fixed-Satellite Service

"A radio communication service

--between earth stations at specified fixed points when one or more satellites are used; in some cases this service includes satellite-to-satellite links, which may also be effected in the inter-satellite service,

--for connection between one or more earth stations at specified fixed points and satellites used for a service other than the fixed-satellite service (for example mobile-satellite service, broadcasting-satellite service etc...)"

There were changes to many of the general definitions which are relevant to this service. These are:

Space Station	21 A
Earth Station	21 B
Space radiocommunication	21 C
Space System	84 AF
Satellite System	84 AFA
Satellite Network	84 AFB
Satellite Link	84 AFC
Multi-Satellite Link	84 AFD
Spacecraft	84 BAA
Satellite	84 BAB
Active Satellite	84 BAC
Passive Satellite	84 BAD
Orbit	84 BB
Inclination of Orbit	84 BC
Period	84 BD
Altitude of Apogee (Perigee)	84 BE
Geosynchronous Satellite	84 BFA
Geostationary Satellite	84 BG
Equivalent Satellite Link Temperature	103 A
Co-ordination Distance	103 B
Co-ordination Contour	103 C
Co-ordination Area	103 D

3.0 FREQUENCY ALLOCATIONS

a)

2500-2535 MHz	FIXED
(Regions 2 and 3)	FIXED-SATELLITE (space-to-earth)
	MOBILE except aeronautical mobile
	BROADCASTING-SATELLITE

2655-2690 MHz	FIXED
(Regions 2 and 3)	FIXED-SATELLITE (earth-to-space)
	MOBILE except aeronautical mobile
	BROADCASTING-SATELLITE

The relevant footnotes pertaining to these 2 bands are 364D which urges administrations to avoid using the band 2655 to 2690 MHz for new troposcatter systems, 364C which requests that new troposcatter systems avoid looking within 2 degrees of the geostationary orbit for the band 2500-2690 MHz, and 364E which restricts the Fixed-Satellite Service to regional or domestic systems and makes its use subject to the agreement of other administrations.

The sharing criteria for this space service are included in

470 G Earth station EIRP limits.

470 L Earth station minimum angle of elevation.

470 NE Power Flux density.

The sharing criteria for the terrestrial services operating in these bands are:

470 AA Orbital avoidance by Radio Relay stations.

470 B EIRP limits for Radio Relay stations.

470 BA EIRP limits for Radio Relay stations.

470 C Transmitter power limits for Radio Relay stations.

b) 6625-7125 MHz

Footnote 392AA also allocates this band to the fixed-satellite service on a secondary basis in Brasil, Canada and the United States in the space-to-earth direction. In Region 2 the power flux density limits are in accordance with 470 NM of article 7. In Regions 1 and 3 the limits are 6 dB less. Receiving earth stations may not impose restrictions on the locations or technical parameters of existing or future terrestrial stations of other countries.

c)

10.95 - 11.2 GHz and	FIXED
11.45 - 11.7 GHz	FIXED-SATELLITE (space-to-earth)
(Worldwide)	MOBILE

The sharing cirteria for the space service are given in

470 NQ Power Flux Density

d)

11.7 to 12.2 GHz	FIXED
(Region 2)	FIXED-SATELLITE (space-to-earth)
	MOBILE except aeronautical mobile
	BROADCASTING
	BROADCASTING-SATELLITE

The relevant footnotes for this band are 405 BB which states that the terrestrial service shall only be introduced after there have been agreed plans for the space services, and 405 BC which indicates that the use of this band by the Fixed-Satellite service is limited to domestic systems and is subject to the previous agreement among admistrations concerned.

There are no power flux density limits nor other sharing criteria in Article 7 that are applicable to this band.

e)

12.5 - 12.75 GHz	FIXED
(Regions 2 and 3)	FIXED-SATELLITE (earth-to-space)
	MOBILE except aeronautical mobile

There are no footnotes relevant to this band.

The sharing criteria for the space service in this band are:

470 G Earth station EIRP limits.

470 L Earth station minimum angle of elevation.

The sharing criteria for the terrestrial services are:

470 AB Orbital avoidance.

470 B EIRP limits for radio-relay stations.

470 CA Transmitter power limits for radio-relay stations.

f)

14.0 - 14.3 GHz	FIXED-SATELLITE (earth-to-space)
and	RADIO NAVIGATION
14.3 - 14.4 GHz	FIXED-SATELLITE (earth-to-space)
(Worldwide)	RADIO NAVIGATION-SATELLITE

The relevant footnote in these bands is 408 A which indicates that the Radio-Navigation and Radionavigation-Satellite services must be operated in such a manner as to provide adequate protection to the space stations of the Fixed-Satellite service.

g)

14.4 - 14.5 GHz	FIXED
(Worldwide)	FIXED-SATELLITE (earth-to-space)
	MOBILE

The sharing cirteria for the space services in this band are:

470 GA Earth station EIRP limits.
470 L Earth station minimum angle of elevation of antenna.

The sharing criteria for the terrestrial service are in

470 AB Orbital avoidance.
470 B EIRP limits for radio-relay stations.
470 CA Transmitter power limits for radio-relay stations.

h)

17.7 - 19.7 GHz	FIXED
(Worldwide)	FIXED-SATELLITE (space-to-earth)
	MOBILE

The sharing criteria for the space services in this band are:

470 NY Power Flux density limit.

i)

19.7 - 21.2 GHz (Worldwide)	FIXED SATELLITE (space-to-earth)

This allocation is exclusive and there are no sharing criteria.

j)

27.5 - 29.5 GHz (Worldwide)	FIXED FIXED-SATELLITE (earth-to-space) MOBILE

The sharing criteria for the space services in this band are:

470 GA Earth-Station EIRP limits.

470 L Earth Station minimum angle of elevation.

The sharing criteria for the terrestrial service are:

470 B EIRP limits for radio-relay stations.

470 CA Transmitter power limits for radio relay stations

k) The following frequency bands have been allocated to the FIXED-SATELLITE service on an exclusive worldwide basis:

29.5 - 31 GHz	(earth-to-space)
40 - 41 GHz	(space-to-earth)
50 - 51 GHz	(earth-to-space)
92 - 95 GHz	(earth-to-space)
102 - 105 GHz	(space-to-earth)
140 - 142 GHz	(earth-to-space)
150 - 152 GHz	(space-to-earth)
220 - 230 GHz	(Direction unspecified)
265 - 275 GHz	(Direction unspecified)

There are no footnotes or sharing criteria applicable in these bands.

4.0 OTHER REGULATIONS

A number of additional Regulations were adopted by the Conference which relate to the Fixed-Satellite Service. These Regulations are:

--470 V (Cessation of emissions), which states that all space stations must be fitted with devices to ensure immediate cessation by telecommand when required.

--470 VA (Interference between Geostationary and non-Synchronous Satellites), which states the conditions under which a non-synchronous satellite must cease its emissions in order to protect geostationary satellites.

--470 VB to 470 VE (Station-keeping of Space Stations), which state the capability required of space stations and the circumstances under which they must comply with these requirements.

--470 VF (Pointing Accuracy of Antenna on Geostationary Satellites), which indicates the pointing accuracy capabilities required of these antennae and the circumstances under which this accuracy must be maintained.

--470 VG (Power Flux Density at the Geostationary Orbit). The band 8025-8400 MHz has been allocated to the Earth Exploration-Satellite service in the space-to-earth direction, i.e. in the direction opposite to that of the Fixed-Satellite Service. In order to protect the Fixed-Satellite Service, a power flux density limit of 174 $dBW/m^2/4$ KHz at the orbit will be prescribed by this Regulation.

BROADCASTING-SATELLITE SERVICE

1.0 GENERAL

The provisions made for the Broadcasting-Satellite Service by the WARC-ST cover an entirely new area of technological application, insofar as the Radio Regulations are concerned. Since the E.A.R.C. (1963), where no provisions whatsoever were made, the attitudes of nations generally have changed and become more forward-looking, presumably as a result of the impetus and interest generated within the United Nations itself, particularly through the Working Group on Satellite Broadcasting of the Committee on the Peaceful Uses of Outer Space, and pursued with greater vigor by certain international organizations such as WIPO, UNESCO, and the ITU.

It will be noted that the Conference decided, through Resolution Spa F, that all broadcasting-satellite operations should be conducted in accordance with eventual plans elaborated and agreed upon by World or regional planning conferences. However, provisional coordination procedures are given in Resolution Spa G to cover such operations as may be introduced before the establishment of definitive plans; the Broadcasting-Satellite Service is not covered by the procedures of Article 9A, although the provisions of Resolution Spa G are very nearly identical with them.

2.0 DEFINITIONS

The Broadcasting-Satellite Service has been redefined as follows:

> "A radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public. (The term 'direct reception' shall encompass both individual reception and community reception)".

Additionally, the expressions "individual reception" and "community reception" are also defined in footnotes. For this purpose, the definitions agreed to at the Special Joint Meeting (Feb 1971) were adopted, viz:

> Individual Reception: "The reception of emissions from a broadcasting-satellite space station by simple domestic installations and in particular those possessing small antennae".

Community Reception: "The reception of emissions from a broadcasting satellite space station by receiving equipment, which in some cases may be complex and have antennae larger than those used for individual reception and intended for use:

- by a group of the general public at one location,

or

- through a distribution system covering a limited area."

3.0 FREQUENCY ALLOCATIONS

Despite efforts by various countries, including Canada, to obtain exclusive or lightly shared allocations in appropriate portions of the spectrum, the Conference in fact made no exclusive allocations to the Broadcasting-Satellite Service below 40 GHz.

620-790 MHz: New footnote 332A provides, within the band 620-790 MHz, for assignments to be made to frequency-modulated TV stations in the Broadcasting-Satellite Service, subject to the provisional technical limitations of Rec. Spa DD and subject to agreement among the administrations concerned and affected. (See Resolutions Spa F and Spa G). To protect the terrestrial broadcasting service, Recommendation No. Spa DD recommends that such stations will not produce a power flux density in excess of -129 dBW/m^2 for angles less than 20°, increasing to -113 dBW/m^2 for angles of 60° or greater, except by agreement with other administrations affected. Note that this will require the use of energy dispersal techniques. The recommendation urges that the transmission of unmodulated carriers be avoided and that as a matter of urgency the CCIR recommend PFD limits to replace these provisional limits. The adoption of this limit in the form of a Recommendation rather than as an Article 7 provision, was a compromise resulting from an irreconciliable disagreement on a definitive value.

There were strong objections on the part of most European countries to any satellite broadcasting in the band 614 to 890 MHz. Their main objections included the large number of existing or planned terrestrial broadcasting operations in the entire band, and the large number of tropospheric scatter systems above 790 MHz. They were also against the power flux density limit which had been proposed by the Special Joint Meeting of the CCIR (i.e. -121dBW/m^2). Presumably, tests

performed in the U.K. and, to a more limited extent, in France had indicated the inadequacy of the S.J.M. recommendation in protecting terrestrial broadcasting. The resulting compromise allows satellite broadcasting between 620 and 790 MHz, at a power flux density limit which is 8 db below the S.J.M. recommended value.

2500-2690 MHz: In Region 2, the use of this band is broken down as follows:

2500-2535	FIXED, FIXED-SATELLITE (Space-to-Earth) MOBILE except aeronautical mobile, BROADCASTING-SATELLITE
2535-2655	FIXED, MOBILE except aeronautical mobile, BROADCASTING-SATELLITE
2655-2690	FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE except aeronautical mobile BROADCASTING-SATELLITE

In Canada, the band 2500-2550 MHz is also allocated on a primary basis to the Radiolocation Service, per footnote 361A.

Footnote 361B limits Satellite Broadcasting in this band to domestic and regional systems for community reception, subject to agreement among administrations concerned (See Resolutions Spa F and Spa G). The power flux density limits of -152 dBW/m^2 in any 4 kHz band for angles up to 5°, increasing to -137 dBW at 25° or greater (see Article 7, Nos. 470 NH to 470 NK), may be exceeded on the territory of any administration which has so agreed (see No. 470 NZB). Footnote 364C states that "When planning new tropospheric scatter radio relay links in the band 2500-2690 MHz, all possible measures shall be taken to avoid directing the antennae of these links towards the geostationary satellite orbit".

The strongest supporters for the allocation of this band to the broadcasting-satellite service were the developing countries, particularly those from Africa. Asians and Latin-Americans held divided opinions. The addition of the Fixed-Satellite allocations in the two 35-MHz extremes of the band is intended to provide for thin-route communications to remote areas. While seemingly encroaching on the broadcasting satellite potential, it does permit a country to combine within a single satellite operation, a modest number of broadcasting channels for community reception along with some telex and telephony service.

11.7-12.2 GHz: In Region 2, this band is allocated as follows:

FIXED
FIXED-SATELLITE (Space-to-Earth)
MOBILE except aeronautical mobile
BROADCASTING
BROADCASTING-SATELLITE

Footnote 405 BC limits satellite-broadcasting to domestic systems, subject to previous agreement among administrations concerned. To ensure compatibility between the uses desired by each country, footnote 405 BB prohibits the introduction of terrestrial services before planning has been agreed for the space services; this condition therefore emphasizes the need for planning the use of this band, at least on a Region 2 basis, pursuant to Resolution Spa F.

No PFD limits are imposed, and sharing criteria are left to be negotiated under the provisions of Resolutions Spa F and Spa G.

The corresponding earth-to-space band would be 14.0-14.5 GHz, although the use of other up-bands such as at 6 or 19 GHz could also be envisaged.

41-43 GHz and 84-86 GHz:

These bands are allocated exclusively to the Broadcasting-Satellite Service. This total of 4 GHz is the only exclusive allocation to Satellite Broadcasting in the WARC/ST allocations up to 275 GHz. Just how useful these bands might be for broadcasting, from the propagation point of view may prove interesting. It may also be of interest to note that the Japanese were the main proponents of these allocations.

4.0 SHARING CRITERIA

Of the two following regulations, the first applies to all space services while the second applies to the Broadcasting-Satellite Service only:

(1) 470 NZB which provides for exceeding the PFD limits described above "on the territory of any administrations which has so agreed".

(2) 428 A requires that satellite broadcasting spillover on neighboring countries be reduced to a minimum unless previous agreement has been reached.

SPACE RESEARCH SERVICE

1.0 GENERAL

The provisions adopted for this service below 40 GHz mainly expand existing frequency allocations which are presently shared with the Fixed and Mobile services. Experience since 1963 has shown that exclusive allocations are not necessary. Provisions for additional spectrum were based on future space research programs beyond 1974 which will employ improved systems with wider bandwidths. In some cases it was necessary to adopt allocations on a secondary basis.

The frequency allocations above 40 GHz have been made on an exclusive basis or, in a few cases, on a shared basis with radio astronomy. These bands will be used for radiometric measurements, whence the need for exclusive allocations.

A number of recommendations were adopted in relation to ionospheric research satellites. The original intent of one proposal was to prohibit these satellites from transmitting in certain bands in order to provide protection for radio astronomy observations above the ionosphere and on the far-side of the moon. This would have prohibited operations such as Alouette and ISIS. This restriction was removed and the CCIR has been asked to recommend on the frequency bands most suitable for radio astronomy observations on the far-side of the moon.

2.0 DEFINITIONS

The definition of Space Research Service was modified as follows:

> "84AM Space Research Service - a radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes".

3.0 FREQUENCY ALLOCATIONS

New footnotes 203A, 221B, MOD235 and 236A provide for the use of the Standard Frequency bands and other narrow channels below 140 MHz by the Space Research service on a secondary basis.

In the bands 138-143.6 MHz and 143.65-144 MHz, Space Research (Space-to-Earth) was added on a secondary basis in Regions 2 and 3, sharing with the Fixed and Mobile services which have primary status. A similar provision is made for a number of countries in Region 1 by footnotes 281G and 282A.

Footnote 319A was modified to provide for the use of the band 449.75-450.25 MHz by the Space Research service (earth-to-space), subject to an agreement among the administrations concerned and affected.

As a consequence of the determination that Space Research could share with the Fixed and Mobile services, these were added in Region 2, on a primary basis, in the bands 1700-1710 MHz, 2290-2300 MHz and 8400-8500 MHz; these bands were formerly exclusively allocated to the Space Research service in Region 2.

Footnote 356A was modified to provide for the use of the band 1750-1850 (earth-to-space) in Region 2, and the band 2200-2290 (space-to-earth) in Regions 2 and 3, by the Space Research service, subject to agreement among administrations concerned and affected. This is an expansion of the bandwidths previously provided for in footnotes 356A and 356B, the latter now being suppressed.

New footnote 356ABA provides for the use of the band 2025-2120 MHz (earth-to-space) in Region 2, and the band 2110-2120 MHz in Regions 1 and 3, by the Space Research service, subject to agreement among administrations concerned and affected.

Footnote 392B was modified to provide for the use of the band 7145-7235 MHz (earth-to-space) (formerly 7120-7130 MHz) by the Space Research service, subject to agreement among administrations concerned and affected.

New footnotes 405BF and 408B provide for the use of the bands 13.25-14.2 GHz (earth-to-space) and 14.4-15.35 GHz (space-to-earth) by the Space Research service, subject to agreement by administrations concerned and affected. The frequency band 15.25-15.35 GHz, which was previously exclusively allocated to the Space Research service, is now allocated only to the Fixed and Mobile services.

Above 40 GHz, exclusive allocations were made to Space Research (passive) near the atmospheric molecular absorption bands at 52-54.25, 58.2-59, 64-65, 101-102 and 182-185 GHz. In addition, other bands were allocated to Space Research (passive) on a shared basis with Radio Astronomy, in the vicinity of the low attenuation atmospheric "windows", at 86-92, 130-140 and 230-240 GHz. The bands 51-52 and 65-66 GHz were allocated to the Space Research service, sharing on an equal basis with the Earth Exploration Satellite service.

4.0 SHARING CRITERIA

Space-to-earth

Space research systems are subject to the same power flux density restrictions, in bands shared on an equal basis, as other space services (See 470N series).

Earth-to-space

Earth stations for Space Research (deep-space) are permitted a higher equivalent isotropically radiated power towards the horizon (see 470GC and 470GD) than that allowed for other space services (470G, 470GA and 470H). Also, the minimum angle of elevation permitted for Space Research station antennae (see 470LA) is different from that allowed for other space services (470L).

In those bands not shared on an equal basis with the Fixed and Mobile services, and which are subject to agreement among administrations concerned and affected, the sharing criteria are also subject to agreement. The allocations to the Space Research service above 40 GHz are either on an exclusive basis or shared with the Radio Astronomy service. In both cases the allocation is for passive only and, therefore, no sharing criteria are necessary.

RADIO ASTRONOMY

1.0 GENERAL

A number of new allocations were adopted for the Radio Astronomy service. However, a number of the footnote allocations are considered to be weakly worded and the protection that astronomers will acquire pursuant to these footnotes will depend largely on the policies of the individual administrations in their implementation of the Radio Regulations.

The Astronomers were of the opinion that a number of allocations, in particular the allocations to the Mobile-Satellite service at 322-328 MHz and 406-406.1 MHz, and the allocation to the Broadcasting-Satellite service at 2690-2700 MHz, have reduced the protection previously afforded to Radio Astronomy in these bands.

2.0 DEFINITIONS

No new nor modified definition was adopted for this service.

3.0 FREQUENCY ALLOCATIONS

A worldwide exclusive allocation was obtained between 21.85 and 21.87 MHz. This will be of some value although it is considered somewhat narrow for radio astronomy purposes. Recommendation Spa KK, introduced by Canada and accepted by the Conference, recommends that Administrations review the possibility of clearing a band 50 kHz wide between 10 MHz and 15 MHz. An allocation in this frequency range is badly needed but it was not possible to do anything more than look towards some future Conference.

The band 37.75 MHz-38.25 MHz remained a secondary allocation in the Table, in spite of efforts to raise half of it to primary status. A footnote, calling on Administrations to take all practicable steps to protect Radio Astronomy in this band, was added.

Footnote 310, which previously covered the band 322-329 MHz, now quotes an upper limit of 328.6 MHz.

In the band 406-410 MHz, a Canadian attempt to obtain exclusivity for Radio Astronomy received no support. There was no real change in the allocation although Radio Astronomy will now appear in the Table, as a Primary service, instead of being provided for by footnote. The introduction of the Mobile-Satellite service between 406.0 MHz and 406.1 MHz may well mark the beginning of attempts to insert other services in bands now allocated to Radio Astronomy.

There was no change in the 606-614 MHz allocation. Attempts to obtain exclusivity in Regions 1 and 3, and to align the bands in all three Regions, were defeated.

Weak footnotes asking Administrations to bear in mind the needs of Radio Astronomy were adopted to cover the frequency bands 1350-1400 MHz, 1611.5-1612.5 MHz and 1720-1721 MHz.

Improvements in the allocations to Radio Astronomy were obtained in the vicinity of the main hydroxyl lines. The band 1660-1670 MHz has been allocated on a primary worldwide basis to Radio Astronomy; the Meteorological-Satellite service was suppressed, and sharing is now with Meteorological Aids only. In addition, the band 1664.4-1668.4 MHz is covered by a footnote which gives additional protection to Radio Astronomy in particular, by allowing assignments only to ground-based stations in the Meteorological Aids service.

A footnote, asking administrations to bear in mind the needs of Radio Astronomy in the band 2670-2690 MHz, was adopted. Use of the 2500-2690 MHz band by the Broadcasting-Satellite service could seriously impair the usefulness of the exclusive 2690-2700 MHz Radio Astronomy allocation.

The Conference adopted footnotes asking administrations to bear in mind the needs of Radio Astronomy in the bands 4825-4835 MHz and 4950-4990 MHz. The former protects the formaldehyde line and the latter extends the continuum allocation 4990-5000 MHz. The Conference adopted a somewhat stronger footnote asking administrations to take all practicable steps to protect Radio Astronomy in the band 4750-5770 MHz; this was a USSR proposal to cover an hydrogen recombination line and has, up to now, been of interest to no one else.

Radio astronomy was given primary table status in the band 10.60-10.68 GHz; no change was made in the present 10.68-10.70 GHz exclusive allocation.

The formaldehyde band 14.485-14.515 GHz was covered by a footnote calling on administrations to take all practicable steps to protect Radio Astronomy.

The 19.3-19.4 GHz allocation was suppressed in favour of an exclusive worldwide allocation at 23.6-24.0 GHz. In addition the water vapour band 22.21-22.26 GHz was allocated on a primary basis by footnote.

An attempt to broaden the present exclusive allocation to Radio Astronomy in the band 31.3-31.5 GHz resulted in a footnote asking administrations to take all practicable steps to protect Radio Astronomy in the 31.2-31.3 GHz band. A similar footnote was adopted in respect of the 36.438-36.488 GHz band.

Above 40 GHz, allocations to Radio Astronomy were made in the bands 86-92 GHz, 130-140 GHz and 230-240 GHz. As these are shared only with Space Research passive, they can in practice be considered as exclusive allocations. In addition a footnote allocation covering the carbon monoxide band 115.16-115.38 GHz was adopted.

Recommendation Spa JJ, concerning Radio Astronomy observations from the shielded area of the moon, recommends that the C.C.I.R. study the frequency bands most suitable for such observations, and urge administrations to maintain the present interference-free nature of the shielded side of the moon.

EARTH EXPLORATION AND METEOROLOGICAL-SATELLITE SERVICES

1.0 GENERAL

The Earth Exploration Satellite service is a new service and it is envisaged that systems in this service will, by means of sensing equipment on spacecraft and sensor platforms on the earth's surface, provide valuable data in many scientific fields. Initial systems, while employing long-life polar orbiting satellites, will be supplemented by satellites of wider bandwidth in either polar or synchronous orbit.

While the principle of providing frequency allocations for this new service was well received by the Conference, there were some areas where negotiation was difficult mainly because of the opposition of certain countries concerning sharing with Fixed and Mobile services.

The Meteorological-Satellite service, as envisaged by the 1963 Space Conference, has now been expanded to include advanced concepts such as geostationary operational environmental satellites and data collection from large numbers of remote data sensing platforms on the earth. A change in definition was required to permit the new generation of meteorological satellites to function within the Radio Regulations and permit the intergration of Meteorological-Satellite and Earth Exploration Satellite systems. This was accomplished by including the Meteorological-Satellite Service in the more general Earth Exploration-Satellite Service.

2.0 DEFINITIONS

84 ASA - Earth Exploration-Satellite service

"A radiocommunication service between earth stations and one or more space stations in which;

- information relating to the characteristics of the Earth and its natural phenomena is obtained from instruments on earth satellites;
- similar information is collected from air-borne or earth-based platforms;
- such information may be distributed to earth stations within the system concerned;
- platform interrogation may be included".

84 AT - Meteorological-Satellite service

"An earth exploration-satellite service for meteorological purposes".

3.0 FREQUENCY ALLOCATIONS

The band 401-403 MHz was allocated to the Meteorological-Satellite service (earth-to-space) on a secondary basis. In addition, footnote 315C provides that Earth Exploration-Satellite service applications other than the Meteorological-Satellite service may also be authorized in this band for earth-to-space transmissions subject to not causing harmful interference to stations operating in accordance with the Table. It is envisaged that these bands would be used for uplink transmissions from remote data sensor platforms.

The existing secondary allocation to the Meteorological-Satellite in the band 460-470 MHz was modified to indicate the space-to-earth direction of transmission. Footnote 324C was added which provides that: Earth Exploration-Satellite service applications other than the Meteorological-Satellite service may also be authorized in this band for space-to-earth transmissions, subject to not causing harmful interference to stations operating in accordance with the Table. This band could be used for interrogation of remote data sensor platforms.

The band 1525-1535 MHz was allocated to the Earth Exploration-Satellite service on a secondary basis. This was the result of a proposal from France.

The band 1670-1690 MHz was allocated to the Meteorological-Satellite service (space-to-earth) on a primary basis. This was proposed as a consequence of the deletion of the service from the band 1660-1670 MHz, effected to improve the protection to Radio Astronomy in the band 1660-1670 MHz. The power flux density limits of 470NE apply.

The existing primary allocation in the band 1690-1700 MHz to the Meteorological-Satellite service was modified to indicate the direction of transmission space-to-earth. In addition, footnote 324C shown above for the band 460-470 MHz was added. This band, together with 1670-1690 MHz, can be used for the transmission of remote sensor data collected by the satellite to a main ground station. In addition, it can be used for the transmission of data, including weather facsimile, from the satellite to forecast centers.

In the band 2025-2120 MHz a new footnote 356AB provides that in Regions 2 and 3, this band may be used for earth-to-space transmissions in the Earth Exploration-Satellite service, subject to agreement among administrations concerned. In Region 1, the band is limited to 2096-2120 MHz.

The band 7450-7550 MHz was allocated to the Meteorological-Satellite service (space-to-earth) on a primary basis, shared with the Fixed-Satellite, Fixed and Mobile services. The new Table allocation replaces existing footnote 392F which gave Meteorological-Satellites 100 MHz in the bands 7200-7250 MHz and 7300-7750 MHz. The new band can be used by second generation geostationary operational environmental satellites. The power flux density limits of 470NM apply.

The band 8025-8400 GHz was allocated to the Earth Exploration-Satellite service (space-to-earth) on a primary basis in Region 2, and on a secondary basis in Regions 1 and 3. The power flux density limits of 470NQ apply. It is expected that this band would be used for wideband data transmission from a first operational Earth Exploration-Satellite system. This band is shared with the Fixed-Satellite (earth-to-space), Fixed and Mobile services. Since the transmission directions are reversed, sharing criteria are necessary to protect the Fixed-Satellite receivers from the Earth Exploration Satellite transmissions; the required power flux density limit is given in 470NG.

New footnote 394E allocates the band 8175-8215 MHz to the Meteorological-Satellite service (earth-to-space).

The band 21.2-22 GHz was allocated to the Earth Exploration-Satellite service on a primary basis, shared with the Fixed and Mobile services. It is possible this band would be used for a second generation operational Earth Exploration-Satellite system that might develop in the post 1980 time period. The power flux density limits of 470NY apply.

The bands 51-52 GHz and 65-66 GHz were allocated to the Earth Exploration-Satellite service on a primary basis, shared with Space Research.

4.0 SHARING CRITERIA

The sharing criteria set forth in Article 7 of the Radio Regulations apply to these services where the bands are allocated on an equally shared basis with the fixed and mobile services. Where the use of the frequencies are subject to agreement among the administrations concerned and affected, the sharing criteria are also subject to agreement.

MOBILE-SATELLITE SERVICE
RADIONAVIGATION-SATELLITE SERVICE

1.0 GENERAL

Although Canada did not propose the 150.5-174 MHz band for the Maritime Mobile-Satellite service, IMCO and CIRM, with support by the UK, introduced proposals which were adopted as reflected in Footnote No. 287A which provides for the use of 100 kHz at 157 MHz and 161 MHz, by the Maritime Mobile-Satellite service, for safety and distress purpose, commencing not earlier than 1 Jan 1976 (See Resolution No. Spa B).

The Canadian proposed footnote 308A, for use of space techniques by the Mobile-Satellite service in the 235-328.6 MHz and 335.4-399.9 MHz bands, was adopted except that the lower limit of the band was changed from 235 MHz to 240 MHz.

Based on a USA proposal, an allocation to the Mobile-Satellite service (Earth-to-space), for the use of emergency position-indicating radiobeacon (EPIRB), was provided at 406-406.1 MHz. The efforts of various nations (UK, Sweden and Norway) with IMCO and CIRM support, to obtain two slots each 2 MHz wide between 400 MHz and 615 MHz for use of space techniques by the Maritime Mobile-Satellite service, were not successful. However, Recommendation Spa II recognizes the additional needs of the Maritime Mobile service at the lower frequencies (around 400 MHz) and invites the CCIR and a future Administrative Radio Conference to review the matter. The Canadian proposal for the use of space techniques by the Aeronautical Mobile and Maritime Mobile-Satellite services in the band 1535-1660 MHz was generally accepted but the amount of spectrum which was allocated to each service, either exclusively or shared, differs from our proposals. While we had originally proposed a total of 5 MHz for Maritime, 30 MHz for Aeronautical and 10 MHz shared between these two services, the allocation adopted is for a total of 15 MHz for Maritime, 30 MHz for Aeronautical and 2 MHz shared. The remaining spectrum left to Aeronautical Radionavigation is 78 MHz. A common translation frequency scheme (101.5 MHz) proposed by Canada, was adopted.

Canada did not submit proposals for the Aeronautical Mobile-Satellite, the Maritime-Mobile-Satellite, the Aeronautical Radionavigation-Satellite and the Maritime Radionavigation-Satellite services in the bands above 40 GHz. However, the following allocations were made to these services on a shared basis: 43-48 GHz, 66-71 GHz, 95-101 GHz, 142-150 GHz, 190-200 GHz and 250-265 GHz. While the early use of these bands is not foreseen, these allocations will nevertheless provide guidance to industry for the development of such systems. Existing frequencies used for

distress and safety by terrestrial mobile services can now be employed for search and rescue operations related to manned space vehicles; these frequencies are 2182 kHz, 3023.5 kHz, 5680 kHz, 8364 kHz, 121.5 MHz, 156.8 MHz and 243 MHz. The frequencies 10003 kHz, 14993 kHz and 19993 kHz, which are located within the Standard Frequency bands, may also be used for this purpose.

2.0 DEFINITIONS

84 AGA "Mobile-Satellite Service

A radiocommunication service:

- between mobile earth stations and one or more space stations; or between space stations used by this service;
- or between mobile earth stations by means of one or more space stations;
- and if the system so requires, for connection between these space stations and one or more earth stations at specified fixed points."

84 AGB "Aeronautical Mobile-Satellite Service

A mobile-satellite service in which mobile earth stations are located on board aircraft. Survival craft stations and emergency position indicating radiobeacon stations may also participate in this service".

84 AGC "Maritime Mobile-Satellite Service

A mobile-satellite service in which mobile earth stations are located on board ships. Survival craft stations and emergency position, indicating radiobeacon stations may also participate in this service".

84 AGD "Land Mobile-Satellite Service

A mobile-satellite service in which mobile earth stations are located on land."

84 APC "Radiodetermination-Satellite Service

A radiocommunication service involving the use of radiodetermination and the use of one or more space stations."

84 AQ "Radionavigation-Satellite Service

A radiodetermination-satellite service used for the same purposes as the radionavigation service; in certain cases this service includes transmission or retransmission of supplementary information necessary for the operation of the radionavigation systems."

84 AQA "Aeronautical Radionavigation-Satellite Service

A radionavigation-satellite service in which mobile earth stations are located on board aircraft."

84 AQB "Maritime Radionavigation-Satellite Service

A radionavigation-satellite service in which mobile earth stations are located on board ships."

In addition to the above, it should be noted that the modification to No. 415 under Article 6 of the Radio Regulations also allows for:

a) an earth station in the Fixed-Satellite service to transmit to mobile stations, on a secondary basis, on its normal frequencies;

b) a land station to communicate with earth stations in the Fixed-Satellite service, on a secondary basis;

when special circumstances make it indispensable to do so.

3.0 FREQUENCY ALLOCATIONS

Maritime Mobile-Satellite Service

157.3125-157.4125 MHz and 161.9125-162.0125 MHz

Region 1	Region 2	Region 3
156-174 MHz	150.05-174 MHz	150.05-170 MHz
FIXED	FIXED	FIXED
MOBILE except aeronautical mobile	MOBILE	MOBILE
201A 285 287 287A 288	201A 233A 287 287A	201A 287 287A 290

"287A. In the frequency bands designated for the maritime mobile service in accordance with Appendix 18 of the Radio Regulations, the use of satellite systems for safety and distress may be authorized on certain channels on an exclusive basis in the band 157.3125-157.4125 MHz for transmissions from ships to satellites and in the band 161.9125-162.0125 MHz for transmission from satellites to ships. The date on which satellite systems may be brought into use shall not be earlier than 1 January 1976 (see Resolution No. Spa B)."

It should be noted that, in accordance with Resolution Spa B, the 1974 World Administrative Maritime Radio Conference, can decide on the specific channel arrangement to be used for this purpose and make consequential changes to Appendix 18 and to the Radio Regulations. Since there are approximately 48 fixed systems operating in Canada, the decisions of the Maritime Conference may affect their operation.

Mobile-Satellite Service

240-328.6 MHz and 335.4-399.9 MHz

Region 1	Region 2	Region 3
235-267 MHz	FIXED MOBILE 201A 305 305A 308A 309	
267-272 MHz	FIXED MOBILE Space Operation (Telemetering) 309A 309B 308A	
272-273 MHz	SPACE OPERATION (Telemetering) 309A FIXED MOBILE 308A	
273-328.6	FIXED MOBILE 308A 310 310A	

"308A. The bands 240-328.6 and 335.4-399.9 MHz may also be used by the mobile-satellite service. The use and development of this service shall be subject to agreement among the administrations concerned and those having services operating in accordance with the Table, which may be affected."

It will be noted that Article 7 does not provide for earth station e.i.r.p. limits or power flux density limits in this band. However, the (470V, 470VA) provisions of Article 7 dealing with the cessation of emissions, the station-keeping requirements of space stations (470B, 470VE) and the pointing accuracy requirement of antennae on geostationary satellites (470VF) may apply. As stated in footnote 308A, the acceptable interference criteria shall be agreed upon among administrations concerned.

Mobile-Satellite service

406-406.1 MHz

Region 1	Region 2	Region 3
406-406.1	MOBILE-SATELLITE (Earth-to-space) 314 317A 317B	

"317A. This band is reserved solely for the use and development of low-power (not to exceed 5W) emergency position-indicating radiobeacon (EPIRB) systems using space techniques."

Because of the low power of the EPIRB transmitter, coupled with the necessary high sensitivity of the space station receiver, special attention will have to be paid to the prevention of interference from terrestrial systems. It will be noted that the many countries mentioned in No. 317B reserved the right to operate fixed and mobile services in this band.

Aeronautical Mobile (R) - Satellite

Maritime Mobile-Satellite

1535-1558.5 MHz and 1636.5-1644 MHz

Region 1	Region 2	Region 3
1535-1542.5 MHz	MARITIME MOBILE SATELLITE 352 352D 352E	
1542.5-1543.5	AERONAUTICAL MOBILE (R) SATELLITE MARITIME MOBILE-SATELLITE 352 352D 352F	
1543.5-1558.5	AERONAUTICAL MOBILE (R)-SATELLITE 352 352D 352G	
1558.5-1636.5	AERONAUTICAL RADIONAVIGATION 352 352A 352B 352D 352K	
1636.5-1644	MARITIME MOBILE SATELLITE 352 352D 352H	
1644-1645	AERONAUTICAL MOBILE (R) SATELLITE MARITIME MOBILE-SATELLITE 352 352D 352I	
1645-1660	AERONAUTICAL MOBILE (R) SATELLITE 352 352D 352J	

"352E. The use of this band is limited to transmissions from space stations to earth stations in the maritime mobile-satellite service for communication and/or radiodetermination purposes. Transmissions from coast stations directly to ship stations, or between ship stations, are also authorized when such transmissions are used to extend or supplement the satellite-to-ship links."

"352F. The use of this band is limited to transmissions from space stations to earth stations in the aeronautical mobile(R) and maritime mobile-satellite services for communication and/or radiodetermination purposes. Transmissions from land stations directly to mobile stations, or between mobile stations, of the aeronautical mobile (R) and maritime mobile services are also authorized. The utilization of this band is subject to prior operational co-ordination between the two services."

"352G. The use of this band is limited to transmissions from space stations to earth stations in the aeronautical mobile (R) satellite service for communication and/or radiodetermination purposes. Transmissions from terrestrial aeronautical stations directly to aircraft stations, or between aircraft stations, in the aeronautical mobile (R) service are also authorized when such transmissions are used to extend or supplement the satellite-to-aircraft links."

"352H. The use of this band is limited to transmissions from earth stations in the maritime mobile-satellite service to space stations for communication and/or radiodetermination purposes. Transmissions from ship stations directly to coast stations, or between ship stations, are also authorized when such transmissions are used to extend and supplement the ship-to-satellite links."

"352I. The use of this band is limited to transmissions from earth stations in the aeronautical mobile (R) and maritime mobile-satellite services to space stations for communication and/or radiodetermination purposes. Transmissions from mobile stations directly to land stations, or between mobile stations, of the aeronautical mobile (R) and maritime mobile services, are also authorized. The utilization of this band is subject to prior operational co-ordination between the two services."

"352J. The use of this band is limited to transmissions from earth stations in the aeronautical mobile (R)-satellite service to space stations for communication and/or radiodetermination purposes. Transmissions from aircraft stations in the aeronautical mobile (R) service directly to terrestrial aeronautical stations, or between aircraft stations, are also authorized when such transmissions are used to extend or supplement aircraft-to-satellite links."

The centre of the band (1558.5-1636.5 MHz remains allocated to Aeronautical Radionavigation, primarily for the use and development of airborne electronic aids to air navigation (including collision avoidance system CAS) and also for the use and development of systems using space radiocommunication techniques.

5000-5250 MHz

It should be noted that footnote 383B provides that "The band 5000-5250 MHz is also allocated to the fixed-satellite service for connection between one or more earth stations at specified fixed points on the Earth and satellites used by the aeronautical mobile (R) service and/or the radiodetermination service.

Such use and development shall be subject to agreements and co-ordination between administrations concerned and those having services operating in accordance with the Table, which may be affected."

Allocations above 40 GHz

The bands 43-48 GHz, 66-71 GHz, 95-101 GHz, 142-150 GHz, 190-200 GHz and 250-625 GHz are allocated on a primary basis to the Aeronautical Mobile-Satellite, Maritime Mobile-Satellite, Aeronautical Radionavigation-Satellite and Maritime Radionavigation-Satellite services.

No footnotes or sharing constraints are applicable in these bands. However, Recommendation Spa GG foresees the allocation of these bands to the corresponding terrestrial services by future World Administrative Radio Conferences.

AMATEUR-SATELLITE SERVICE

1.0 GENERAL

A number of new allocations, which allow for the use of space techniques by the Amateur service, were made by the Conference.

2.0 DEFINITIONS

84 ATA "Amateur-Satellite Service

A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service."

3.0 FREQUENCY ALLOCATIONS

7000-7100 kHz, 14000-14250 kHz, 21000-21450 kHz, 28-29.7 MHz, 144-146 MHz

Canada proposed that the above bands, which are presently allocated on an exclusive basis without exception to the Amateur service, be utilized also for amateur satellites. These proposals were adopted.

430-440 MHz, 1215-1300 MHz, 5650-5725 MHz, 10-10.5 GHz, 23-24 GHz

Canada proposed that the above bands, which are presently allocated on a secondary basis (except 23-24.25 GHz) to the Amateur service and to the Radiolocation service on a primary basis, be also utilized by amateur satellites but strictly on an non-interference basis. While many countries supported these proposals, the majority feared that insufficient control of amateur satellite transmissions would result in interference to terrestrial services and consequently, these proposals were defeated.

435-438 MHz

Allowance was made for amateur satellites in the band 435-438 MHz by means of footnote 320A and taking into account the provision of Regulation No. 1567A of Article 41.

Region 1	Region 2	Region 3
430-440 MHz	420-450 MHz	
AMATEUR	RADIOLOCATION	
RADIOLOCATION	Amateur	
318 319 319B 320 320A		
321 322	318 319A 319B 320A 323 324	

"320A. In the band 435-438 MHz, the Amateur Satellite Service may be authorized, on condition that harmful interference shall not be caused to other services operating in accordance with the Table of Frequency Allocations. Administrations authorizing such use shall ensure that any harmful interference caused by emissions from amateur satellites is immediately eliminated in accordance with the provisions of No. 1567A."

"1567A. S6. Space stations in the Amateur Service operating in bands shared with other services shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article 15. Administrations authorizing such space stations shall inform the I.F.R.B., and shall insure that sufficient ground command stations are established before launch to guarantee that any harmful interference that might be reported can be terminated by the authorizing Administration (See No. 470V.)"

24-24.25 GHz

Because of the extensive rearrangement of the allocation table in this area of the spectrum, the existing Amateur allocation at 21-22 GHz was replaced by the following:

Region 1	Region 2	Region 3
24-24.05 GHz	AMATEUR AMATEUR-SATELLITE 410C	
24.05-24.25 GHz	RADIOLOCATION Amateur 407 410C	

Footnote 410C provides for the operation of industrial scientific and medical equipment in the band 24-24.25 GHz without allowing protection to any space or terrestrial radiocommunication services using this band.

STANDARD FREQUENCY AND TIME SIGNAL SATELLITE SERVICES

1.0 GENERAL

New services were defined to provide for the use of space techniques for transmissions of standard frequency and time signals. These new definitions were the result of proposals submitted to the conference by Canada for frequency allocations in the 4 and 6 GHz bands which were adopted by the conference. At the very end of the conference a US proposal at 400 MHz was also adopted.

2.0 DEFINITIONS

84 ATB "Standard Frequency-Satellite Service

A radiocommunication service using space stations on earth satellites for the same purposes as those of the standard frequency service."

84 ATC "Time signal-Satellite service

A radiocommunication service using space stations on earth satellites for the same purposes as those of the time signal service."

3.0 FREQUENCY ALLOCATIONS

The band 400.05 to 400.15 MHz was allocated to the Standard Frequency-Satellite service on a world-wide exclusive basis with emissions confined to $\pm$25 kHz of the frequency 400.1 MHz.

Footnote 379A provides for the use of the frequencies 4202 MHz (space-to-earth) and 6427 MHz (earth-to-space) $\pm$2 MHz by the Standard Frequency and Time Signal Satellite services. Such use is subject to agreement among Administrations concerned and affected.

These two allocations satisfy fully the two recommendations from study group 7 of the CCIR as contained in the report of the CCIR Special Joint Meeting.

4.0 SHARING CRITERIA

As the first allocation is on an exclusive basis there are no sharing criteria necessary. Sharing criteria for the second set of allocations are subject to agreement in accordance with footnote 379A.

SPACE OPERATION SERVICE

1.0 GENERAL

This is a new space service which is designed to cover the functions concerned with the operation of spacecraft. It also simplifies the allocation of frequencies to a specific service such as the Fixed-Satellite service insofar as it eliminates the need for footnotes which were previously necessary in order to avoid any doubt that such transmissions as telemetry tracking and telecommand were also permitted in the bands allocated to that service. In some cases, however, specific allocations have been made to the Space Operation service for one or more functions.

2.0 DEFINITIONS

" Space Operation Service

A radiocommunication service concerned exclusively with the operation of spacecraft, in particular tracking, telemetry and telecommand.
These functions will normally be provided within the service in which the space station is operating."

3.0 FREQUENCY ALLOCATIONS

The allocations at the lower part of the spectrum, i.e., below 1.6 GHz, consist only in a change of definition, that is the allocations were adopted by the 1963 Conference for the general Space Service and designated for a specific function, i.e. tracking, telemetry, etc. These frequency bands are the following:

30.005-30.010 MHz, 137-138 MHz, 267-273 MHz, 401-402 MHz, 1427-1429 MHz and 1525-1535 MHz.

Above 1.6 GHz, there were no new allocations to the Space Operation service; however, footnotes which until now provided for the use of bands allocated to the Communication-Satellite service for operational functions were deleted, since, in accordance with the definition of the Space Operation service, these functions will be performed within the bands allocated to any specific space service.

4.0 SHARING CRITERIA

There is no sharing criteria for the bands allocated to the Space Operation service; however, the sharing criteria set forth in Article 7 for the various space services which are allocated on an equally shared basis with the Fixed and Mobile servides would apply to any Space Operation function.

INTER-SATELLITE SERVICE

1.0 GENERAL

The frequency bands allocated to this service are above 40 GHz and are allocated on an exclusive basis for space-to-space communications. The bands are located in parts of the spectrum close to peaks of atmospheric absorption and are therefore protected from any future use which may be made by terrestrial services as a result of allocations which may be adopted by future conferences for the terrestrial services. Recommendation No. Spa FF was adopted in this respect.

2.0 DEFINITIONS

84 AT "Inter-Satellite Service

A radiocommunication service providing links between artificial earth satellites."

3.0 FREQUENCY ALLOCATIONS

The bands 54.25-58.2 GHz, 59-64 GHz, 105-130 GHz,170-182 GHz and 185-190 GHz were allocated on an exclusive basis to the Inter-Satellite service.

4.0 SHARING CRITERIA

As these are exclusive allocations, sharing criteria are not necessary.

ARTICLE 9

The main heading of this article was amended to conform to the change of term "Terrestrial Services" to "Terrestrial Radiocommunications".

No. 486.4

Changes were made to 486.4 to include the new terms "Terrestrial Radiocommunications" and "Coordination Area" and to indicate that the provisions of 492A apply in all bands above 1 GHz which are shared equally with the terrestrial radiocommunications services.

No. 490

Two amendments were made to this Regulation.

- The first was made, at the suggestion of the I.F.R.B., to require the notification of full particulars of all terrestrial stations within the coordination area of an earth station, rather than just those of a typical station.

- The second amendment was initiated by a French proposal for a Resolution that would have made mandatory the dispatch of information to the I.F.R.B. pertaining to each terrestrial station with e.i.r.p. in excess of the values indicated in Appendix 28, irrespective of the location of such stations. The intent of this Resolution was to provide an administration planning an earth station with information on existing high-powered terrestrial installations which could hamper the operation of the earth station, and thus enable this administration to take the appropriate technical measures to ensure compatability between earth station and these terrestrial stations. While the french proposal had undeniable merits, many other countries were opposed to it on the basis that nothing in the existing Regulations prevented any administration from supplying such information on certain types of terrestrial communication systems. A considerably diluted version of the French proposal was accepted and introduced into No. 490 whereby terrestrial stations with e.i.r.p's in excess of those shown in Table II of Appendix 28 may be notified, although such notification is not compulsory.

No. 491

Our proposal to amend No. 491 was accepted. The time period for notification to the Board of assignments to terrestrial stations, i.e. "not earlier than three years" and "no later than ninety days" before the terrestrial assignments (within the coordination area) are brought into use, is identical with the time period for the notification of assignments to earth stations referred in the new 639BF of Article 9A.

No. 492

The amendment to No. 492 is consequential to that made in No. 491 and takes into account the required notification of terrestrial assignments within the coordination area within a nimimum period of 90 days before putting the assignment to use.

Nos. 492A and 492B

The amendments which have been made to these two Regulations have resulted from the following considerations:

a) during the coordination procedure under 639AN pertaining to new frequency assignments to an earth station, the administration operating the earth station sends a coordination area diagram and the information as per Appendix 1A to all other administrations within the coordination area. Subsequently, the administration operating terrestrial stations examines the matter to determine whether:

   i) interference will be caused to the reception of its existing stations or stations to be operated within the next three years, by an earth station transmitting in a shared earth-to-space band;

   ii) interference will be caused to the earth station receiver, by existing fixed or mobile stations or stations to be operated within the next three years, in a shared space-to-earth band.

b) looking at the above situation in the context of 492A and 492B it was considered that the coordination of new terrestrial receiving assignments (assignments which are to be placed into operation 3 years after the earth station) was not necessary since an administration planning terrestrial receiving stations in the coordination area of an earth station is already aware of the parameters of the earth station and thus it is up to this administration to locate and orient its receiving antennae so that no interference will be received from the earth station.

c) however, an administration planning terrestrial transmitting assignments to be placed in operation 3 years after the earth station) must coordinate with the earth station to ensure that the earth station receiver will not be interfered with. The existing paragraph in 492B b) was found unnecessary for the reasons given above.

d) it will be noted that the term "harmful interference" has been replaced with the word "interference" because the former term which is defined in No. 93 as "an emission which seriously degrades a radiocommunication service" does not satisfy the objectives of the coordination procedure between earth stations and fixed or mobile stations. In other words, a level of acceptable interference noise must be mutally agreed to by the administrations concerned at the time of coordination; this acceptable level of interference noise is considerably lower than that which would cause "harmful interference".

No. 492A

The coordination procedure under 492A is applicable to stations in any terrestrial service and to earth stations in any space service. Appendix 28 covers sharing criteria between earth stations and the fixed and mobile services only. Sharing criteria not covered under Appendix 28 must be agreed between administrations concerned, until such time as the C.C.I.R. has developed those still required.

No. 492C

The term "level of interference" has been used here to indicate the acceptable level of interference to an earth station which is mutually agreed upon by the administrations concerned at the time of coordination and it must not be exceeded by a future change in the characteristics of a terrestrial station. If there is a danger of exceeding this agreed level of interference, the terrestrial assignment must then be re-coordinated vis-à-vis the earth station.

No. 492D

All our proposed time periods after which an administration may request the Board to effect coordination were accepted except in the case of b) where a period of 90 days was deemed more appropriate than 60 days in those cases where an administration fails to give a decision in response to a request for coordination.

No. 492E

Here again, and for reasons previously given, the term "harmful interference" is not applicable. It is the calculated level of interference noise which is being assessed.

Nos. 492F, FA, FB, FC

These four new regulations which pertain to the procedure to be taken by the Board in case of coordination difficulties have the same objective as that of our proposed amendment to 492F. In other words, our proposed 492F has been subdivided in four parts in an attempt to clarify the procedure.

No. 492G

In this case, the Board will assess the level of interference that an earth station may receive from a terrestrial transmitter.

No. 492GA

This Regulation covers the case where an administration operating an earth station persists in objecting to the establishment of a new terrestrial station; it also takes into account the possibility that this administration may not have valid technical grounds on which to base its objections.

No. 492GB

This new Regulation is a cross reference to 639AQ in Article 9A. Its purpose is to make it clear that the Board, in examining terrestrial assignments vis-à-vis earth station assignments, will only take into account those assignments which existed before the earth station coordination

began or assignments which will be placed in operation within the next three years. All existing and future terrestrial assignments within the coordination area of an earth station should, if adequate protection is to be obtained, be notified at the appropriate time.

Nos. 570AG, AGA, AGB, AGC and 570AJ

The amendment to 570AG and the addition of 570AGA, AGB and AGC are similar in intent to the provision introduced in Article 9A under 639BX, BY and BZ. The main purpose of this Regulation is to ascertain that, before an out-of-band frequency assignment is notified under No. 115, the administration submitting this notice should first ensure that the assignment will not interfere with the reception of an earth station and that, if this 115 assignment is submitted upon insistence, that it will only be recorded in the Master Register after a period of use of 120 days without complaint of interference.

No. 570AX

The new sentence at the end of this Regulation provides an operational time period of 120 days to ensure that no interference will be caused to an earth station before recording of the related frequency assignment; this covers the case where the service is operating in an appropriate band but where there has been an unfavourable finding by the Board with respect to the likelihood of interference to an earth station.

Nos. 635A and 635B

These regulations provide for the assistance of the Board to new and developing countries in verifying coordination area charts, studies of interference levels, and other assistance of a technical nature.

ARTICLE 9A

Article 9A embodies procedures for the advance publication of information about satellite communication systems, for coordination with other satellite systems and with certain types of terrestrial systems, for notification of assignments to satellite systems, for examination by the I.F.R.B. of such notified assignments, and for any related action by Administrations and/or the Board.

The Canadian delegation submitted proposals on four subjects related to Article 9A, as follows:

1) the introduction of an advance publication procedure for satellite systems (CAN/17/131),

2) the introduction of procedures for coordination among satellite systems (CAN/17/133 and seq.),

3) provisions granting priority of rights according to date to satellite systems (CAN/17/157 and Corr. 17/165),

4) provisions regarding the elimination from the Master Register of assignments no longer in use (CAN/17/160 to 163).

Canada also submitted numerous proposals regarding the timeframes and details of the particular procedures in Article 9A. Each of the four points will be discussed below, focusing on the one hand on the original Canadian proposals, and on the other, on an assessment of the provisions in the Final Acts in the light of these proposals. As distinct from other articles in the Radio Regulations, the final provisions of Article 9A were not so much the result of trade-offs among different and often incompatible proposals as of compromises among different administrations' approaches (particularly United States, United Kingdom, France and Canada) to essentially the same series and sequence of procedures.

(1) ADVANCE PUBLICATION

It was Canada's original intention to introduce procedures whereby an administration planning to establish a satellite system would, in advance of any formal coordination, inform other administrations of its plans and invite their comments. This would save it the trouble and cost of proceeding into great detail with plans which might later be hindered by unforeseen objections of other administrations, and the advance knowledge of such systems would be of benefit to other administrations in their own plans. The Canadian intention was, moreover, to keep this procedure as preliminary, flexible and general as possible, leaving detailed coordination for the next phase.

The U.S. and U.K. proposals for the advance publication procedure were far more detailed than this, however, and attempted to spell out the precise procedures and delays involved at each step. And the French proposals for the start of their coordination procedure went even beyond this, requiring that the publishing administration provide sufficient details to determine the administrations with whom detailed coordination would subsequently have to be undertaken (on the basis of Delta T). Delta T, or more correctly ΔT, represents the apparent increase in equivalent noise temperature of a particular station which is caused by the introduction of adjacent systems. In Appendix 29, a value of 2% is utilized to determine the need for detailed coordination with specific systems.

The compromise among these proposals resulted in the French agreeing to a separate publication procedure prior to coordination (New Section I) with the others accepting that the publishing administration would provide the details listed in new Appendix 1B to provide the information sought by the French (No. 639AA).

The Canadian delegation insisted on the deletion of all references to rights acquired or obligations discharged at this stage, and succeeded in inserting provisions regarding the flexibility of the procedure at the various steps along the way (e.g. No. 639AH).

(2) COORDINATION

With respect to the parties with whom geostationary space system coordination would be undertaken, Canada supported the U.S. proposal which was finally adopted (No. 639AJ) to include not only those administrations with assignments in the Master Register but also those who had themselves begun coordination. This would take account of all administrations seriously engaged towards establishing geostationary satellite systems and would avoid late-stage confrontations. Procedures were also adopted (at No. 639AM) whereby an administration which feels that it has been inadvertently left out of a coordination process can insist that it be brought in.

That this space system-to-space system coordination procedure should be added to Article 9A to parallel the existing precedures for earth station-to-terrestrial service coordination, was accepted without opposition.

(3) PRIORITY TO EARLIER SATELLITE SYSTEMS

It was the intention of Canada (and the U.S. to some extent) to clearly state that where there are two systems, each established in conformity with the Regulations, etc., interferring with each other, the later one should cease operations in view of the prior right to protection of the earlier.

While no delegation disagreed with the principle and with its de facto validity, there was no support to render it explicit. All that was finally accepted (in No. 639DD) was the attenuated principle that where a system which was established in conformity with the Regulations, etc., suffered interference from one which had been recorded by insistence (having failed in one or more of the tests of conformity with the Regs) and had been recorded at a later date, the later system should cease the harmful interference.

(4) THE "DEADWOOD" PROBLEM

All administrations have long agreed that assignments no longer in use but still recorded in the Master Register are undesirable in that they can become the basis for unfavorable findings against legitimate new assignments, in that they amount to unjustifiable occupancy of possibly valuable frequency assignments (and geostationary orbit locations), and in that they generally render systems planning more complex and costly than is necessary.

On the manner of dealing with this "deadwood" however, there were at least 3 different positions. The Canadian proposals were the most radical and would have provided for:

a) administrations to inform the I.F.R.B. whenever the use of an earth or space station assignment has or is to be discontinued for a period exceeding 180 days;

b) the I.F.R.B. to inquire from administrations regarding the use of assignments which appear to have been discontinued for a period of 180 days;

c) the I.F.R.B. to delete assignments from the Master Register if no answer to its enquiry under b) is received within 180 days;

d) the I.F.R.B. to delete assignments which have not or are not to be used for a period exceeding one year.

The above provisions proposed by Canada are applicable not only to those deadwood assignments which would create coordination problems to new space assignments but to all deadwood assignments.

The U.K. and the U.S. (the latter had submitted proposals similar to Canada's but had switched to support for the U.K. proposals) took the following position: that not all "deadwood" should be dealt with but only those assignments which were the basis for an unfavourable finding to a new assignment; that these should not be deleted but only given a lower status in relation to the new assignment; and that the I.F.R.B. should have no powers in this process.

The French proposal sought to deal with the same category of assignments as the U.K., and agreed with no deletion. (In fact, no other delegation supported the Canadian deletion proposals, obstensibly on the grounds of the difficulty in giving effect to them). However, like Canada, France wanted to reduce the status of these assignments vis-à-vis all new assignments, and was prepared to grant the Board certain powers in the process.

The compromise finally agreed upon included the first three parts of the Canadian proposals, (a, b, c) reworded to remove the notion of full deletion but to provide for the virtual elimination of the status of assignments not in use for eighteen months (Nos. 639DK, 639DL and 639DM) where the administrations responsible for them do not indicate to the I.F.R.B. that they will be brought back into use within a further six months (2 years in all).

Secondly, it included a proposal (No. 639BS) to reduce the status of particular assignments not in use for 2 years that are the basis of unfavourable findings to new assignments. And as a third element the "deadwood" package, the Conference passed a French recommendation (SpaLL) suggesting that subsequent Administrative Radio Conferences (each in its own area of competence - e.g. Space Maritime, etc.) might review frequency assignments in congested bands with a view of taking additional measures to cope with deadwood.

II RELATED MATTERS

1) Broadcasting

The French, Argentinian and Brazilian delegations originally submitted draft resolutions which would have strongly discouraged administrations from establishing broadcasting satellite systems prior to the adoption of a world broadcasting plan. Moreover, they would have prohibited not only any system which interfered with terrestrial services, but also those whose transmissions spilled over the territories of countries not wanting to receive these transmissions.

The Canadian position in reaction to these was that, while the concept of plans might be acceptable, these could be either world plans or regional plans; that until such plans were adopted, states should not be prohibited from establishing broadcasting satellite systems; that these "interim" systems should be subject to similar rules of coordination, and should enjoy the same protection, as other space systems as provided for in article 9A; and that the only question of concern to the I.T.U. in the matter of transmission to other territories was that of the possibility of harmful interference to radiocommunication services in those territories, and not the question of the content or acceptability of programmes. To have permitted states to object to systems on the grounds that there would be some spillover into their territories, would have been to endow them with a completely unacceptable veto power. A Canadian compromise proposal covering the spillover condition was accepted for insertion in Article VII of the Radio Regulations (No. 428A).

With respect to the other points, the two French broadcasting resolutions adopted (in greatly amended form) by the Conference are not incompatible with the Canadian position. Resolution Spa F accepts the principle of world or regional broadcasting plans and invites the Administrative Council to examine the question of a world conference "and/or regional conferences if necessary". The U.S.S.R. and most third world countries insisted on the priority of the world conference (in fact a U.K. draft resolution proposing a 12 GHz European plan was defeated) but they were unable to get any stronger wording than that indicated above which does not rule out prior regional conferences, especially if these are called for purposes of preliminary planning.

Resolution Spa G outlines two sets of procedures for coordination and notification of broadcasting satellite stations. The first provides for coordination with terrestrial services and fills a gap in Article 9A. The second provides for coordination with other satellite stations.

With regard to the second, it was the Canadian view, shared by the U.K. and the U.S., that Article 9A adequately provided for this type of coordination. However, the U.S.S.R. was extremely intent on excepting satellite broadcasting from Article 9A. The compromise was that Article 9A would not be applicable to satellite broadcasting but that Resolution Spa G would re-introduce virtually all of Article 9A's relevant provisions. Resolution Spa G accordingly poses no problem for Canada.

2) The U.S. Relocation Proposal

Just prior to the Conference, the U.S. delegation introduced a proposal whereby administrations would be obliged to relocate their satellites in the geostationary orbit where it was necessary in order to accomodate new systems and where it was possible for them to do so. Originally intended for detailed embodiment in the Regulations and in a Resolution as a mandatory procedure, the concept was introduced by the U.S. as a voluntary matter, and in the course of the conference it was further attenuated to the point where the proposed resolution was withdrawn. The notion of relocation is alluded to in the Radio Regulations at the advance publication state (at No. 639AF) but without further explanation. It is merely provided there

that at this early stage a newcomer must exhaust all possibilities for accommodating itself without adjustment to other systems. Once having done so, it may approach other administrations, and under 639AF (b) explore with them all possible means of meeting its requirements, "for example", by the other administration "relocating one or more of its own geostationary space stations". A similar mention is made of relocation in 639AF (c).

The Canadian position was that while the original proposal had certain attractions in terms of facilitating the access of newcomers to geostationary orbit positions, unless a voluntary and minimalist approach were adopted, an unfair economic burden might be placed on administrations operating established systems. The final results are indeed minimalist and optional.

3) The U.S.S.R. Resolution on equal rights to frequencies

This resolution, grandiloquently worded, was passed with near unanimous public support (but with many private expressions of synicism). The only discordant note was sounded by Canada, which suggested that if the resolution was to be respected by states, it must not place unrealistic demands upon them. What resulted was one amendment changing "all necessary measures" to all practicable measures" that should be taken by countries "in order to realize the possibility of the use of new space systems by other countries or groups of countries so desiring".

4) Resolution re CCIR Recommendations on sharing criteria

This resolution, supported by Canada, permits consenting administrations to employ - as between themselves - for coordination purposes, the latest CCIR recommendations regarding criteria for sharing between the space and terrestrial services and within the space service. In the case where one administration does not so agree, the criteria in the Radio Regulations would continue to apply as is the case at present.

III) GENERAL SUMMARY AND ASSESSMENT

No precepts basic to the Canadian radio regulations religion were profaned. The compromise creeds finally consummated were compatible with our own.

SUMMARY OF RESOLUTIONS AND RECOMMENDATIONS

Resolution No. SPA A

This resolution permits Administrations to continue to authorize ionospheric research satellites, such as the Alouette I and II and ISIS II, in the MF and HF bands.

Resolution No. SPA 3

During the discussions of the Technical Committee at the conference, it became evident that there were a large number of subjects which either required further technical study or new studies by the CCIR. The majority of these items were included in this omnibus Recommendation, which is a revision to Recommendation SPA 3 of the 1963 EARC.

Resolution No. SPA B

Resolves that the 1974 Maritime Mobile Conference will further consider and decide if and to what extent the two 100 kHz channels (157.3125-157.4125 MHz and 161.9125-162.0125 MHz) should be utilized by space systems for safety and distress purposes. This could result in the 1974 Conference allocating a wider bandwidth for this purpose.

Resolution No. SPA C

As a result of modified and new definitions for the space services consequential administrative amendments will have to be made to the List of Stations in the Space and Radio Astronomy services. The Conference did not have time to make these modifications and the Secretary-General and the IFRB are authorized by this resolution to carry out these changes.

Resolution No. SPA D

Deals with equal rights in the use of frequency bands allocated to the Space services and resolves

1) that registration and use should not provide permanent priority,
2) that countries operating space systems should take all practicable measures to realize the use of new space systems by other countries,
3) that the above should be taken into account by the administrations and the permanent organs of the Union.

Resolution No. SPA E

Relates to a procedure whereby the relevant current recommendations of the CCIR pertaining to sharing criteria in equal shared bands may be used by Administrations and the IFRB in application of the radio regulations.

Resolution No. SPA F

Resolves that the Administrative Council examine as soon as possible the question of date, place and agenda of a world and/or regional administrative conference to develop broadcasting satellite plans.

Resolution No. SPA G

Sets forth a procedure for the coordination, use and notification of frequencies by the Broadcasting-Satellite service pending adoption of frequency plans by the conference or conferences mentioned in Resolution SPA F.

Recommendation No. SPA AA

The co-ordination procedure (Appendix 28), developed by the CCIR SJM and modified at the WARC, requires further study in certain areas. These areas are Tables I and II, and include also the development of propagation data at frequencies below 1 GHz and above 40 GHz. This Recommendation invites the CCIR to give further study to these matters.

Recommendation No. SPA BB

Recognizing that the use of energy dispersal by fixed-satellite systems using analogue modulation will alleviate sharing problems with the terrestrial service as well as with other fixed satellite systems, this Recommendation recommends that the fixed-satellite service should employ this technique as far as practicable; in the discussions it was recognized that any manadatory requirement for energy dispersal for low-capacity fixed-satellite systems could place severe constraints on such systems and therefore, energy dispersal should be used as far as practicable consistent with the satisfactory operation of the system. It was also recommended that energy dispersal techniques should be used in the fixed-service employing digital modulation when this becomes feasible.

Recommendation No. SPA CC

Normal telecommunications facilities in disaster areas due to damage and other causes, are often inadequate for emergency communications. Known planning of space radiocommunication systems does not provide specific frequencies or channels for this purpose. This Recommendation recommends that administrations in space radiocommunications planning provide for the needs of eventual relief operations, identify preferred radio-frequency channels and facilities for this purpose, and waive for transportable earth stations used for relief operations, the coordination procedures provided in the Radio Regulations. The recommendation invites the C.C.I.R. to study standard specifications and preferred frequencies for transportable earth stations and compatible mobile and transportable fixed radiocommunications equipment for relief operations.

Recommendation No. SPA DD

During the discussions of the power flux density limits necessary to protect the terrestrial broadcasting service from the satellite broadcasting service in the band 620-790 MHz, it became evident that no agreement could be reached on a single set of limits for inclusion in Article 7 of the Regulations. Therefore, it was agreed that a provisional limit could be accepted as a Recommendation of the Conference and that the CCIR be requested to undertake urgently the further study of definitive sharing criteria. This Recommendation gives the two limits that were under consideration as well as the provisional limit, and indicates those areas which require further study by the CCIR.

Recommendation No. SPA EE

The Conference was unable to effect a more logical rearrangement of Article 1 of the Radio Regulations necessitated by amendments thereto. This recommendation recommends that the next World Administrative Conference competent to revise Article 1 should consider a more logical rearrangement of the Article. A format for such rearrangement is suggested.

Recommendation No. SPA FF

The bands 54.25-58.2 GHz, 59-64 GHz, 105-130 GHz, 170-182 GHz and 185-190 GHz were allocated by the Conference to the inter-satellite service. These bands are located in parts of the radio frequency spectrum close to peaks of atmospheric absorption. Attenuation due to atmospheric absorption protects the inter-satellite and terrestrial radiocommunication services from mutual interference.

This Recommendation recommends that a future world administrative radio conference consider allocating the above bands also to terrestrial radiocommunication (except the aeronautical mobile) services.

Recommendation No. SPA GG

The Space Conference allocated the 43-48 GHz, 66-71 GHz, 95-101 GHz, 142-150 GHz, 190-200 GHz and 250-265 GHz bands to the following satellite services: aeronautical mobile, maritime mobile, aeronautical radionavigation, and maritime radionavigation. This Recommendation recommends that future allocations of these bands to terrestrial radiocommunication services should be limited to corresponding services.

Recommendation No. SPA HH

The Space Conference allocated the 41-43 GHz band to the broadcasting satellite service. This Recommendation recommends that a future conference give consideration to allocating this band to the fixed and mobile services.

Recommendation No. SPA II

This Recommendation refers to a request by the Inter-Government Maritime Consultative Organization (I.M.C.O.) for frequencies at about 400 MHz for the maritime mobile satellite service, and to C.C.I.R. conclusions at the Special Joint Meeting, Geneva 1971 that the provision of such exclusive channels was desirable.

This Recommendation points out that small ship and survival craft stations are completely dependent on radiocommunications and that there is uncertainty that the new provisions adopted at the Conference for the maritime mobile satellite service, would satisfy their needs. The Recommendation recommends that further review of the matter be made by administrations, international organizations and the C.C.I.R., and that a competent administrative radio conference, if it deems it necessary, provide additional frequency allocations for the maritime mobile satellite and safety services.

Recommendation No. SPA JJ

The shielded area of the moon, i.e. that which is more than 23.2° beyond the limb of the moon as seen from the centre of the Earth is an area of maximum value for radio astronomy, being free of interference from terrestrial transmission.

This Recommendation recommends that the C.C.I.R. study which frequency bands are most suitable for radio astronomy observations on that area, and the criteria for the application and protection of such bands, that in the meantime, administrations ensure non-interference to the observations, and that any pertinent C.C.I.R. Recommendations be applied.

Recommendation No. SPA KK

This Recommendation considers the requirements of the radioastronomy service for an exclusive frequency allocation near 10 MHz and recommends that administrations consider releasing a band of frequencies 50 kHz wide for the use of the radioastronomy service between 10 MHz and 15 MHz, and that a future world administrative radio conference consider an exclusive allocation in that region of the spectrum.

Recommendation No. SPA LL

This recommendation is addressed to the possibility that in the future, as use of frequencies and orbital positions increases, administrations may, - despite the provisions enacted by the Conference for consultation and coordination between administrations, - experience undue difficulty in one or more frequency bands in meeting their space radiocommunication needs. The Recommendation recommends that if such a situation arises, the next appropriate world administrative conference should be empowered to examine all aspects of use of the relevant frequency band(s) and to find a solution.

Recommendation No. SPA MM

In the present Regulations and in the Recommendations of the CCIR, information on the technical criteria required for assessing harmful interference above 28 MHz was considered inadequate. This recommendation invites the CCIR to study the subject and to recommend such technical criteria. It also invites the IFRB to publish its technical standards based upon the provisions of the Radio Regulations, the Recommendations of the CCIR, and the state of the art.

Recommendation No. SPA NN

Some of the important problems facing the Conference included the near-insuperable sharing problems which exist between troposcatter systems and the various space services. These troposcatter systems are now operating in many frequency bands and therefore, the subject of protection for these systems arose many times in those bands where space services were proposed. Canada, in conjunction with some other administrations, prepared this Recommendation which requests the CCIR to urgently study the radio-frequency requirements for troposcatter systems and recommend preferred radio frequencies for such systems, and requests a future administrative conference to allocate specific portions of the fixed service bands to troposcatter systems, in order to de-escalate this problem.

COMPARISON BETWEEN NEW AND EXISTING SERVICE TERMS

New terms for services using space radiocommunications	Existing terms for services using space radiocommunications	Existing terms for services using terrestrial radiocommunications
Fixed-Satellite Service	Communication-Satellite Service	Fixed service
Mobile-Satellite Service	None	Mobile service
Aeronautical Mobile-Satellite Service	Non	Aeronautical Mobile Service
Maritime Mobile-Satellite Service	None	Maritime Mobile Service
Land Mobile-Satellite Service	None	Land Mobile Service
Broadcasting-Satellite Service	Broadcasting-Satellite Service	Broadcasting Service
Radiodetermination-Satellite Service	None	Radiodetermination Service
Radionavigation-Satellite Service	Radionavigation-Satellite Service	Radionavigation Service
Aeronautical Radionavigation-Satellite Service	None	Aeronautical Radionavigation service
Maritime Radionavigation-Satellite Service	None	Maritime Radionavigation service
Earth Exploration-Satellite Service	None	None
Meteorological-Satellite Service	Meteorological-Satellite Service	Meteorological Aids Service
Amateur-Satellite Service	None	Amateur service
Standard Frequency-Satellite Service	None	Standard Frequency Service
Time Signal-Satellite Service	None	Time Signal Service
Space Research Service	Space Research Service	None
Space Operation Service	Space Service (tracking, telemetry or telecommand)	None
Inter-Satellite Service	Space Service (space to space)	None
Safety Service	None	Safety Service