INTERNATIONAL CIVIL AVIATION ORGANIZATION

REGIONAL COORDINATION MEETING IN PREPARATION FOR THE ITU WRC-2003
(Lima, Peru, 27 to 28 March 2001**)**

Agenda Item 1: Introduction to ITU

The International Telecommunications Union (ITU)

(Presented by Mr. W. T. Young)

SUMMARY

This presentation provides an overview of the ITU processes and describes those elements of particular interest to civil aviation. In the present situation where aviation is being challenged by other radio service users to give up or to share frequencies - or show justification for not doing so - it is important that aviation managers, engineers, and spectrum experts have a basic knowledge of the workings of the ITU regime. Through this understanding, better and more positive strategies may be developed to ensure that future expansions in air traffic do not meet a scarcity of this important resource.

Historical Background of the ITU

Slide 1

Early Years

The ITU is the international organization dealing with telecommunications[1] - which is defined as " any transmission ,emission, or reception of signals - - - - - or intelligence of any nature, by wire, radio, optical or other electromagnetic systems ". Radiocommunications[2] is defined as " telecommunications by means of radio waves ". The ITU has around 186 members worldwide (slightly more than ICAO), and is a Specialized Agency of the UN (as is ICAO) . The ITU is the international body which meets and agrees spectrum use and the conditions for that use. It has a very long history over which it has established primacy in all matters concerned with telecommunications. This slide highlights the key features of the organization.

Radio services commenced in the early years of the twentieth century around 1905, and after operational confusion, much interaction between transmissions, and interference, a Conference in Berlin in 1906 set up the International Radiotelegraph Union to introduce some order. Radio Regulations and a Register of Stations with their carrier frequencies, together with the date of implementation, were agreed. Earlier use of a frequency was accepted as establishing the right to continue its use with protection from any other user who came later. This concept of earlier use

[1] Para 1012 of ITU Constitution
[2] Para 1009 of ITU Constitution

creating precedence in frequency use inaugurated at that time remains as a basic (but unstated) concept in ITU up to the present day. At that time the use of radio tended to be confined to communications with ships at sea .

Technical Standards : CCIR

In parallel three separate bodies were set up to develop and agree technical standards for telephone, telegraph, and radio (the forerunner of the CCIR - now the ITU-R), which in 1932 were joined in a loose federative arrangement with the existing Telegraph and Radio bodies, altogether becoming the International Telecommunications Union.

Atlantic City 1947

A major review of the radio branch took place at the post-war International Radio Conference at Atlantic City in 1947. War time development had advanced considerably the techniques of radio, for example extending the useable spectrum from about 250 MHz to 10 GHz. Good radio communications was seen as a vital and key enabler of progress in the world economies. A semi autonomous board , the International Frequency Registration Board (IFRB) was set up to administer the frequency register and to maintain equity in the process. A new and radically revised form of the Table of Allocations in the Radio Regulations was agreed. An International Telecommunications Convention, amended only at Plenipotentiary Conferences (PPC), was also developed and agreed. As a by product the new Convention conferred treaty status on the Radio Regulations which could only be amended by World Radio Conferences (WRC).

Many aviation services in the VHF and UHF regions of the spectrum were incorporated in the new Table. At that time aviation was a favoured activity, particularly since every world country wished to set up its own national flag carrier airline and join the aviation club. At this time also the ITU was invited to become a Specialized Agency of UN with responsibility for Telecommunications, and after some hesitation agreed to that status. (ICAO had earlier also been recognized as the Specialized Agency for aviation.)

The need for change

In the 40 years after 1947 there were few changes to the Convention or the basic set up of the ITU . Around 1988 radio techniques, and spectrum use, had progressed to a stage where structural changes were essential to meet the explosive demand for all types of radio services. Also, the rapid advances in information technology, called for a strategy re-think to maintain the ITU in the forefront of the telecommunications sciences. A Plenipotentiary Conference in 1989 separated the Convention in to 2 parts. One, a Constitution, which laid down fundamental principles, rights, and obligations - and secondly a Convention which dealt with more administrative matters, such as the operation of the Secretariat, and the IFRB.

A far reaching change introduced at this time was the decision to hold World Radio Conferences (WRC) every 2 to 3 years in which the agreed Agenda could include any topic of immediate concern that addressed the content of the Radio Regulations. This was in substitution for the earlier Conference structure which focussed more on particular services and were held at much longer intervals.

ITU-R to replace CCIR

The CCIR technical body, which had been set up in 1927, was found to be too slow and unwieldy for modern conditions, and was replaced by a Radiocommunications Assembly which normally meets yearly , receiving and endorsing the Recommndations from its subsidiary Study Groups.

Final Comment

Thus, after almost 100 years of existence the ITU remains as the principal international body for telecommunications in the world despite the advances in not only the use of telecommunications, but the rapid growth in information technology and in network implementations. It remains very aware of the challenges appearing from these disciplines, and the oncoming convergence of technologies, and is ready to respond as is necessary. In the field of radio, its record and experience in spectrum management up to now has been unsurpassed , and is unlikely to be seriously challenged by any other body or organization.

The Purposes of the ITU

Slide 2

Article 1 of the ITU Constitution contains the items which define the purposes of the Union. The principal elements relating to spectrum management are :

3 to maintain and extend international cooperation among all its Member States for the improvement and rational use of telecommunications of all kinds ;
5 to promote the development of technical facilities and their most efficient operation ;

and, in particular to :

11 effect the allocation of bands , the allotment of radio frequencies and registration of radio-frequency assignments, - - - - , in order to avoid harmful interference between radio stations of different countries ;
12 coordinate efforts to eliminate harmful interference between radio stations of different countries, and to improve the use made of the radio frequency spectrum, and of the geostationary and other satellite orbits ;

13 Facilitate the world-wide standardization of telecommunications ;

17 ***promote the adoption of measures for ensuring the safety of life through the cooperation of telecommunications services.***

Points to note in these provisions are :

Para 11
This is the enabling clause for the management of the radio frequency spectrum by the ITU. . The reason of " avoiding harmful interference" is a prime motivation for creating a body of Radio Regulations, containing a Table of Allocations, but many other factors and aspects are included in the overall management process.

Para 13
This clause on standardization is only implemented to a minor degree in the radio field, although in line transmission the extent is much greater . Whilst ITU lays down limits for frequency stability, spurious emissions, and other spectrum hygiene measures, the other ITU-R Recommendations can be regarded as good system practices or techniques rather than obligatory standards as it is normally understood.(but see Linked References in a later Module) However, it has created the problem where it is interpreted by some members as declaring that the ITU is the only body that should

develop standards on radio equipment. Such concepts conflict with the work of ICAO and Annex 10 SARPS. Fortunately, it has not been pursued in any formal way up to now. Clearly the safety aspects of aviation equipment is a compelling argument to permit aviation to continue the long established practice of preparing its own system standards for both ground and airborne radio equipment.

Para17

This is very important to aviation (and to other safety services) in that it places a marker on the existence of a safety of life aspect in some radio communications and in navigation. The Radio Regulations emphasize this special treatment through a definition for a Safety Service and through special provisions for the treatment of safety services. Aviation radio services for air navigation and ATC communications automatically fall in to this category.

Status of the Agreements

It will be noted that the signatories to the ITU Convention do not undertake any obligations such as those which are a requirement under the ICAO Convention relating to the implementation of ICAO Standards and Recommended Practices. Essentially the ITU regime is one of cooperation , coordination , and thus relies on a conscientous but voluntary observance of the principles stated in the Convention.

In respect of frequency use this has the consequence that there are no sanctions which can be taken against a country which does not conform to the Radio Regulations - for example by licensing radio stations on a frequency not in accord with the Table of Allocations which later interferes with an adjacent countries services. Bilateral, or multilateral discussions, assisted in difficult cases by the Radio Regulations Board, is the only method of resolving such instances. Despite this undesirable feature there is a very high order of observance by Member States of all of the agreements contained in the Radio Regulations.

Over the years the ITU has shown itself to be a very effective instrument for establishing agreements between all world countries, producing overall a framework of regulation and control in the use of radio in particular, and telecommunications in general. With an explosion in demand for all forms of telecommunications, and the convergence of line, radio, and IT technologies there is a greater need than ever for an effective organization to solve the many problems which arise. The ITU fully satisfies that purpose.

The Structure of the ITU

Slide 3

The organizational structure of the ITU has recently (in 1989) been revised, and is characterized by the following :

- **A Convention and a Constitution as the prime Treaty documents, amended at Plenipotentiary Conferences (PPC) held every 4 years ;**
- **An organizational structure composed of 3 Sectors, - one each for Radio (ITU-R), Telecommunications Standardization (ITU-T), and Telecommunications Development (ITU-D). Each sector operates as an autonomous entity, liaising as necessary on matters of common interest ;**
- **A Secretariat headed by a Secretary General ;**

- **A Council which meets yearly for 2 weeks having 46 nominated members from Member States (with balanced geographic representation) to progress business between meetings of the PPC.**

The PPC is the defining forum on matters of major policy as well as the task of amending the Constitution and the Convention. Other UN Specialized Agencies can also attend as Observers and can input Information Papers, but can not speak unless invited by a Committee Chairman.

The Secretariat carries out all of the administrative functions for the Union.

The financing of the Union is made by its traditional method of voluntary contribution, which is quite different to that adopted by the other UN Specialized Agencies (including ICAO). The latter use a proportional method based on GNP. In ITU each Member State decides unilaterally the number of units it will subscribe within the range of 40 units to one quarter of a unit. Sector Members are also expected to subscribe, and some bigger members may contribute several hundred thousand Swiss Francs. The Unions costs are then divided by the total of units and the precise unit value calculated. Major Members contribute usually between 30 and 40 units, the lesser developed countries perhaps 1 unit or less. At this time 1 unit is about 60,000 Sw.Francs.

The Radiocommunications Sector

The Radiocommunications Sector (ITU--R) deals with all radio matters. Their World Radio Conferences, now held every 2/3 years with an Agenda prepared at the previous Conference and endorsed by the ITU Council, decides on all radio matters in which the ITU has an interest. The ICAO, along with other Specialized Agencies, receive an automatic invitation to attend and submit Information documents, but can not vote, or speak in main Committees without the invitation of a Chairman. WRCs have power over :

- Radio Regulations having Treaty status, amended at World Radio Conferences ;
- A Radiocommunications Assembly, with supporting Study Groups, to prepare technical Recommendations on systems, standards, planning criteria; and any other technical aspect of the work.
- A Radio Regulations Board (RRB) to maintain a Frequency Register and other associated tasks ;
- A Radio Bureau reporting to the RRB and to WRC

The Headquarters of the ITU is in Geneva, Switzerland, and is also normally the venue for Conferences. (The WRC-2000, as an exception was held in Istanbul, Turkey)

In ITU the definitive text in all main documents is the French version - because the original Convention was drafted in the French language as was standard treaty practice at that time. At PPC and WRC the Final Acts are translated to English and Spanish by an editorial committee, and when agreed at the conference have equal status.[1]

The Membership of the ITU is nominally the same as that of ICAO, except that the ITU contains countries with an interest in telecommunications, but without any substantial aviation interest, such as Monaco, the Vatican, Lichtenstien. etc.

[1] By way of contrast, the ICAO Convention has English as the definitive text, as was the original Chicago Convention of 1944. The full trilateral texts in French and Spanish versions are prepared in ICAO HQ in "slow time" and approved by ICAO Council (for Annex material). This procedure has less possibility for discrepancy than text produced in the heat of a Conference.

The next Chapter addresses the subject of World Radio Conferences.

World Radio Conferences - Purposes and Functioning

Slide 5

Introduction

World Radio Conferences (WRC) replaced the earlier World Adminstrative Radio Conferences (WARC) in 1995. A WRC normally lasts 4 weeks and are usually held in Geneva. WRC agenda are compiled two conferences before the event, finalized at the conference before, and then approved at the next meeting of the ITU Council.

Any aspect of the Radio Regulations or its 30 Appendices can be addressed. Proposals for amendment of the Regulations are made by Member States. Observers, including ICAO, are not permitted to make proposals but can submit information documents. Exceptionally ,at the discretion of the conference, documents from the UN Specialized Agencies can acquire quasi proposal status provided they are supported by one Member, and there is no objection. Such process would only occur where the subject matter was such that it very closely reflected the responsibilities of that agency, and where there was a prominent element of safety of life. Traditionally the ICAO has submitted a paper addressing aviation needs.[1]

Purposes and Functioning of World Radio Conferences (WRC)

ITU World Radio Conferences are held specifically and exclusively to consider amendments to the Radio Regulations (see next Chapter) on the basis of proposals submitted by its Member States. The agreed Agenda defines those parts of the RRs to be addressed. WRCs have been held in 1995,1997,2000, and the next is scheduled for 2003. The output for any subject is expected to be agreed without objections, but statements may be included in the Final Acts by any country with objections or qualifications. These are generally few in number. Voting is either by show of hands, or where political or major concerns exist, secret votes are permissible, again not a common procedure.

The ICAO carries out a world wide coordination of aviation views on items of concern to aviation and inputs an information document expressing that coordinated position[1].

Recent trends are for world regions - Europe, the Americas, South East Asia, Arab countries ,Africa - to coordinate regionally prior to conference from which common proposals can be developed. This procedure lessens the number of major conflicts, and eases the way to a resolution of those that remain. Without it WRC could become unworkable.

Procedures at WRC

Procedures at WRC are strict and conform to long standing practices. A Committee structure is agreed, which includes, inter alia, a Franchising Committee (to disbar Members who have not paid subscriptions), and an Editorial Committee to prepare and agree the Final Acts. The latter has French Chairmanship and English and Spanish members to prepare the 3 language texts. All final texts are given 3 readings in main Plenary before acceptance.

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[1] See for example ICAO State Letter Ref : E 3/5-99/74 of 9 July 1999

Output of WRC

The standard output is the Final Acts, signed by all Members wishing to support. A date is set for ratification, or notification of adherence, usually 6 to 9 months from Conference completion, at which time a country formally accepts the agreements in the Final Acts. No changes can be made to the document which conference agrees.

This unwieldy procedure takes no account of events which take place between conferences, and errors in principle can not be corrected when post conference considerations indicates that mistakes have been made. Matters that have not been able to be agreed can be placed in a Conference Resolution, a device of some disputed benefit, which tends to perpretate a body of Resolutions that go on in time, often with no action. A weaker form is a Conference Recommendation, usually adopted for lesser, or limited interest matters, or for technical study initiation on a particular topic. Final Acts have Treaty status for countries that register a ratification, or an adherence. They are available in the public domain.

Major Problem Area

Spectrum scarcity is now a major problem. The explosion in demand, particularly in the mobile services, has exhausted all of the unused capacity. In this process aviation has suffered loss of spectrum , and had enforced sharing wioth other services, in 7 frequency bands. This process will continue. The world wide exclusive character of aviation allocations, are attractive real estate to global services. No easy solution has appeared, and resort to market forces is becoming a popular alleviation measure.

Preparations for World Radio Conferences

Slide 6

Preparation of Proposals

Preparations for a WRC by national radio authorities commence shortly after the last conference ends, giving some 24 to 27 months for the preparation of their countries proposals and submission to ITU. The latter takes place around 4/5 months before the conference so as to permit time for translation in to the 3 languages (F,E,Es) and for sending out to all members.. A WRC agenda normally contains between 30 and 40 items of which the vast majority relate to the Table of Allocations in the Radio Regulations

Each country is responsible for its own proposal and will normally establish some form of consultation machinery to collect and coordinate the views of all the radio service users in its territory. In major countries this coordination also includes the views of industry, and any other body with an interest in the use of radio systems. The national civil aviation authority is normally included in this consultation to put forward the aviation position on agenda items that affect aeronautical radio services. This is rarely less than 9 items, and can be as high as 15. The activity is usually controlled and progressed by the national radio authority who will act as the focal point for ITU radio affairs.

Regional Groupings

The intensive nature of modern conferences has recently - some 10 years ago - led to an informal, regionally based, coordination process in an attempt to derive common regional proposals for as many items as possible, thereby greatly easing the conference workload.. In Europe this is carried out by the 43 country Conference of European Post and Telecommunications (CEPT) body. Other

similar bodies exist in the Far East (AsiaPac group), the Americas (CITEL grouping) , the Arab countries, and Africa. Liaison between these groups further helps to avoid major conflicts at the conference . Common proposals (in Europe these are European Common Proposals -or ECP) can then be submitted naming the countries supporting particular proposals. In the past this has been a highly successful measure. Its disadvantage, particularly for a smaller player such as aviation, is that it severely reduces the scope for changes in position at the conference itself. **It also emphasizes the necessity for a positive aviation involvement all the way through the preparations.**

Conference Preparatory Meeting (CPM)

Most agenda items have a strong technical aspect where the advice of the relevant technical experts is necessary to enable the conference to make a good decision on allocations. Nowadays this is prepared by a 3 week Conference Preparatory Meeting (CPM) held nominally 6 months before the conference itself The work of the CPM can relate to any technical aspect of a radio service, and is usually derived from the outputs of studies carried out by the Study Groups. (see later Chapter) Their Report, in the form of Recommendations,is sent to all ITU members, and to the conference itself as an information paper.

An important example affecting aviation was the WRC-2000 agenda item to decide on the sharing of frequencies between Mobile Satellite services, and GNSS. This required an intensive and prolonged study of protection of the GNSS against the interference from satellite transmissions, which involved the GNSS and AMCP Panels of ICAO, US FAA, European CAAs, ESA, Inmarsat, and others having an interest in satellite navigation and mobile satellite communications. (The final recommendation was that sharing was not possible)

Conference Proposals

Only member states can submit proposals. Major countries proposals usually address every agenda item, and can amount to up to 100 pages. Proposals are framed as specific and detailed amendment of the text in the RRs, together with a supporting argument and rationale. Where a regional common proposal exists the supporting countries refrain from addressing that item in their own submission, relying on the common proposal to state their position. The total number of amendments to be considered is often in excess of 1200, all of which must be considered.

Aviation Input

A world wide aviation coordination has traditionally been carried out by the ICAO This commences[1] around the same time as national preparations and proceeds with the the assistance of the Aeronautical Mobile Communications Panel (AMCP). After approval by the ICAO Council the formal ICAO position is sent to CAAs for input to their national preparations. (see Chapter on ICAO). The same document is input to the conference as an ICAO information document

Coordination at the Conference

As the discussions at the conference develop, coordination meetings are held to decide new policies and positions which reflect the flow of events. Aviation interests normally also hold such meetings under the aegis of ICAO

[1] See ICAO Handbook on Radio Frequency Requirements for Civil Aviation - Doc 9718/ AN/957 Att.D

Status and Content of the Radio Regulations

Slide 8

The Radio Regulations are the prime spectrum management material in ITU The RRs have treaty status and define all of the regulatory elements which are necessary for effective and efficient management of the useable spectrum throughout the world. They can only be amended by a World Radio Conference i.e there is no provision for any changes (except editorial errors) until the next conference. The radio authorities of ITU member states undertake to apply the Radio Regulations within their territory, and in practice this observance is highly respected and conscientously applied. The objectives as stated in the Preamble are to :

- ***Facilitate equitable access to and rational use of the radio frequency spectrum and the geostationary satellite orbit ;***
- ***Ensure availability and protection from harmful interference of frequencies for distress and safety purposes ;***
- ***Assist in prevention and resolution of cases of harmful interference ;***
- ***Facilitate efficient and effective operation of radiocommunications services ;***
- ***Provide for, and regulate new applications of telecommunications technology.***

Contents of the Radio Regulations

A set of regulatory provisions addressing the major topics of :

- Definitions for services and technical features related to spectrum and frequency planning
- **Frequency Allocations to services**
- Procedures for coordination and registration of frequencies
- Provisions for distress and safety communications
- Provisions for individual radio services (including Aeronautical Services)
- Interference - reporting and clearance
- Administative provisions, including licensing

together with

- Appendices (30)[1] addressing planning, technical parameters, and operational procedures.
- Resolutions and Recommendations

Chapters dealing with Aeronautical Matters

Chapter SVIII deals with Aeronautical Services and addresses a mixture of licensing, operational, and frequency matters. There is a very similar Chapter SVIX on Maritime Services which was common with Chapter SVIII until a "simplification" in 1979. This simplification was a highly practical improvement since the Maritime Service - without the benefit of an international document - relies on the RRs for many operational matters. The Chapter contains some highly important provisions such as the the use of Aeronautical Mobile (R) frequencies[1] which is the basic statement of the safety character of air traffic communications. Two further regulations of interest are those which prohibit

1 For example Appendix S27 is the Frequency Allotment Plan for the Aeronautical Mobile (R) HF Service.

[1] S43.1 states " Frequencies in any band allocated to the aeronautical mobile (R) service and the aeronutical mobile-satellite(R) service are reserved for communications relating to safety and regularity of flight between any aircraft and those aeronautical stations and aeronautical earth stations primarily concerned with flight along national and international civil air routes"

public correspondence in exclusive aeronautical bands, and a statement of the order of priority in aeronautical communications. (identical to Annex 10). In aviation terms Chapter SVII addresses matters which relate directly to spectrum management and apply to all aviation whether civil or otherwise. It does not address standards for systems which is the prerogative of ICAO

Chapter SVII, on Distress and Safety, contains important rules and frequencies for distress and safety situations (identical to the aeronautical emergency), including search and rescue, which apply to all mobile services. In these situations it is essential, particularly for Search and Resue situations that inter working between ships, aircraft and where necessary ground vehicles can take place. Common frequencies are specified which include the aeronautical frequencies of 3023 and 5680 KHz, 121.5 and 123.1 MHz. The latter frequency is fitted to many Emergency beacons and is installed in the SARSAT satellite system.

The radio Regulations accept that ICAO Annexes are the world wide agreement on matters related to operational air safety and gives precedence to them wherever appropriate. However, ICAO only receives mention in a single reference, the supplementary footnote S35.1.1. The definitive text for ICAO dispensation uses the words "intergovernmental agreement" which is interpretable to cover ICAO agreements - as well as any other agreement of this type.

Table of Allocations

By far the most important element in the Radio Regulations is Chapter SII on Frequencies. This contains the Table of Allocations which defines the total use and deployment, of the useable spectrum. This is covered in the next slide.

A measure of the content and coverage of the Radio Regulations may be gleaned from the Index of Volume 1 which follows this paragraph.

CONTENT of RADIO REGULATIONS

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Table of Frequency Allocations

Slide 9

The **Table of Frequency Allocations[1] in Chapter SII, Article S.5** is the core, and the major element, in the Radio Regulations. It occupies almost 120 pages of the document. The vast majority of the work of Radio Conferences - as proposed by amendments in states proposals - concerns the modification of the allocations in this Table. This activity is the culmination of the spectrum management process, specifying which frequency band will be used for which purpose, in which area, and under what conditions The Table has been built up, and extended at successive conferences over a period of more than 50 years, with more and more allocations carefully inserted as demand has mushroomed in recent years. It is now a complex, and sometimes difficult to interpret, statement of the agreed radio frequency spectrum use around the world.

The present Table extends from 9 kHz to 400 MHz (but is only allocated up to 275 GHz) and is divided in to many hundreds of bands. Each band is allocated in one or more World Regions (max 3) for the use of particular radio services, eg, broadcasting, aeronautical mobile (R), Maritime Mobile,etc. Each conference will amend only small sections of the table, the greater majority of allocations remain for many years. As technology develops, and higher bands become practicable, some services find it beneficial to move higher up in the frequency table, and in some less frequent cases a service becomes absolescent. (example NDBs in aviation)

Aviation is one of the services that needs very long term assurances of retention of allocations because of the global character of air operations and the ICAO standards process which takes many years to change and implement and then use effectively. (15 plus years for most systems)

Allocation Example ILS/VOR

The allocation example in the slide, which has been extracted from the Table, is the band used by civil aviation for ILS (108-112 MHz) and VOR (108-117.975 MHz). It is a Primary service (indicated by the upper case text) on a world wide exclusive basis - as is usual with bands allocated for radio systems covered by ICAO SARPS.

[1] An "Allocation" is defined (Radio Regulation S1.16) as an entry in the Frequency Allocation Table of a given frequency band for the purpose of its use by one or more services under the specified conditions.(see Module 4)

Of particular importance is the footnote S5.197 which permits, under certain conditions as specified, use by the mobile service. The secondary status implies that no interference to ILS/VOR is permitted. Prior to WRC2000 this footnote contained many European countries, which were removed because of aeronautical objections. This footnote was inserted at a Conference in 1987 because there was an anticipation that ILS/VOR were absolescent - a prediction which no longer applies. This also illustrates the fact that no frequency band is the property of any user, and in fact the footnote was inserted against strong aviation objections. This band has now been identified for GNSS support communications, and a new footnote to achieve this is an agenda item at WRC-2003.

National Tables

Most developed countries produce a statement of their national use of frequencies for internal use purposes which is based on the format of that in the international table but with their national use substituted where there is choice or where their country footnote is applied.

Utilization Aspects

The present format and construction of the Table of Allocations has served the purpose very well since its first introduction over 70 years ago. It still does in most spectrum parts but there are signs of strain in some areas. Multiple allocations in a single frequency with qualifying and country footnotes introduce considerable complexity in interpretation. A good example of this appears in the bands allocated to Mobile satellite use at 1.5/1.6 GHz where the band of about 3 MHZ width at 1610-1613.8 MHz in Region 3 has .4 allocated services and 10 footnotes. This page of the table is shown below.

The Role of the Radiocommunications Assembly and ITU-R Study Groups
Slide 10

The Radiocommunications Assembly (RA) and its supporting machinery is a recent innovation (set up in 1998) and exists to deal with all technical matters pertaining to the Radio Regulations, and to spectrum management. It is a semi autonomous body - as was the CCIR which it replaced - but functionally comes under the umbrella of the WRC machinery.

The technical Study Groups of ITU are a long standing feature of ITU having been set up in 1927 (as the CCIR) on an autonomous basis to deal with the technical questions on which allocation decisions depend for their viability. In addition they study new techniques and developments, operational matters in a limited manner, and any other technical aspects of interest to the use of radio. Their output is in the form of ITU-R Recommendations - or Report (for less mature subjects). For WRC agenda items a programme of directed studies are carried out which are input to the Conference Preparatory Meeting, resulting in a set of Recommendations for countries to use in their WRC preparations

The Study Groups

At the present time there are eight active Study Groups :

SG1 : Spectrum Management
SG3 : Radiowave Propagation
SG4 : The Fixed Satellite Service
SG7 : The Science Services
SG8 : The Mobile, Radiodetermination, and Amateur Services, including the associated satellite elements

SG9 : The Fixed Service
SG10 : Sound Broadcasting, terrestrial and satellite
SG11 : Television Broadcasting,terrestrial and satellite

SG8 and its sub components is the appropriate group for any aeronautical subject. It has separate groups for terrestrial mobile communications (which includes ships and vehicles), radionavigation (a sub set of radiodetermination), and mobile satellite communications. The SG addresses, or more properly takes in to account, operational matters - particularly in the maritime field which has not the benefit of an organization such as ICAO. Safety of life is given special attention, particularly in radionavigation, and safety communications. **All air traffic control communications are recognized as safety communications, some airline operational also, but not airline administrative communications**.

ITU-R Recommendations can be made obligatory by a specific mention in the Radio Regulations inserted by a WRC. This recently introduced measure is an attempt to overcome the inflexible character of the Radio Regulations process and is still to be fully developed. Later amendments to Recommendations only become effective when endorsed by the next WRC.

The RA and the SGs provide the technical bases of all spectrum work, and preserve their independence with vigour and determination. In recent times the industrial and commercial dimension has assumed greater prominence in their work, and many companies, laboratories .and research establishments have some form of membership.

ICAO Involvement

The ICAO enjoys a higher status in ITU-R Study Groups than in ITU conferences - where they are observers only. With aeronautical allocations under stress from proposals to share frequencies with other services this provides a valuable avenue of access to the technical processes. The importance of ITU-R Recommendations in aviation terms is that they are accepted by ITU as unchallengeable statements of the aeronautical situation even though the aviation involvement in their production has at times been quite minimal. As important also is the fact that the update procedure is lengthy, and certainly not capable of the rapid response action which aviation requires and which is a feature of the work in ICAO.

The slide displays the organizational setup for rhe Radiocommunications Bureau and its links with other elements.

The Rights and Obligations of Countries to Use Frequencies

Slide 11

Rights of ITU Members

The Member States of ITU maintain sovereign rights in respect of the use of frequencies and hold the sole responsibility for this use in both the international and the national domains. As part of this position, countries reserve to themselves full jurisdiction over the use of frequencies in their territory. This right extends to the use of any frequency whether or not it is in conformity with the ITU Radio Regulations, except that it is subject at all times to the overriding obligation that none of their stations interfere with another countries service which is in accordance with the RRs and has been registered in the Master International Frequency List (see Module 4). This is a practical arrangement in that

radio can be used in many countries and locations where there is no possibility of interfering with services in another country (a good example is New Zealand whose nearest neighbour is 1600 KMs distant).

The corollary of this policy for aviation is that the aeronautical frequencies used in air navigation, air traffic control, and for other purposes exist through the international agreement in ITU, as accepted and implemented by countries around the world. There are no prescriptive rights, or ownership benefits, in that use. Any of the benefits enjoyed at the moment can be changed at any time by an agreement in ITU, or by national decision. This vital interpretation has to be kept in mind at all times by aviation spectrum managers.

In areas such as Europe with many countries in a small geographic area the right of independence has very little scope. In fact, the reverse is the case where the obligation not to interfere imposes the responsibility to coordinate the use of frequencies - even for allocations in the RRs. Over many years this has been exercised by ITU Regional Conferences as is the case with LF, MF, and VHF broadcasting, and maritime services. For other services this function may be carried out bilaterally or multilaterally, or in some cases through the CEPT.

The Status of Aeronautical Allocations

The right of a country to control and use any frequency for any purpose extends in principle also to the use of the frequencies in the aeronautical allocations. This right is an absolute one with the consequential interpretation that aviation allocations must be justified for retention when called on to do so. In practice this right is not exercised by the radio authority in the recognition that there are important safety aspects to be taken in to account. Also the international character of aviation which normally requires world wide cohesion and uniformity creates difficulties in unilateral action by nay one country in isolation.

It is usual for the civil aviation authority in conjunction with local ICAO offices to prepare a frequency plan for many of the bands used by systems which are specified in Annex 10. However for ITU conference preparation it is the radio authority which has the power of decision.

Obligations of ITU Members

The prime obligation is that of not causing interference to other countries services which are operating in accordance with the Radio Regulations. However all obligations of countries are voluntary based - there are no sanctions written in to the Constitution or Convention of ITU which can be invoked in cases of infringement. Resolving action is bilateral, or multilateral between affected countries and only in cases where this has proved intractable are the (voluntary) services of the Radiocommunications Bureau called in to help. The case of radio used for national defence purposes, and for broadcasts of a political character , are instances where resolution is particularly difficult. This lack of an effective sanction is one of the weaknesses of the ITU regime.

The licensing and control of mobiles operating outside home territory - which includes aircraft - is an important national duty. The systems carried on board and their technical characteristics must be carefully regulated. This involves equipment and operating licenses. Aircraft radio licenses are normally issued by the national radio authority, although the airworthiness requirement is the responsibility of the avaiation authority.

Interference to aircraft radio is not an uncommon occurence where a national radio authority must act quickly to protect all aircraft whatever the country of registration. Recently, cases of interference to HF air-ground communications from unlicensed stations has proved to be particularly resistant to any controlling action.

In practice there is a great deal of adherence to the principles embodied in the ITU Treaties. Without this compliance the system would rapidly become unworkable.

The Role of National Radio Authorities

Slide 12

The National Radio Authority [1] in a country will normally be the body that is responsible for exercising the functions of the implementation and licensing of frequencies, including those rights and obligations which flow from membership of ITU

The national radio authority is normally also responsible for the licensing of all civil radio stations, and for dealing with interference. Preparations for WRC is a further role exercised by the national authority. The radio stations used on the ground and in aircraft registered in that country, as well as personnel radio licensing , also comes under the radio authority.

Most countries also establish a machinery for coordination, and publish a national table of the allocations and uses of the spectrum in their country. Some variation of the RRs is permissible, and the use of agreed footnotes to the Table of Allocations also gives countries the right to deviate from the agreed Table allocation.

Typical National Arrangement

The slide displays a typical national arrangement of the elements required for the administration of radio policy within a country. Different countries will have differing emphasis and components, but the functions shown are the primary tasks which have to be carried out. Spectrum management, deriving in the first instance from the international agreements in ITU have to be interpreted and implemented in to operating radio services serving the needs of all of the community through a framework of national legislation and regulation. The task embodies all of the spectrum management elements of

- Frequency planning and assignment
- Setting standards for spectrum hygiene
- Monitoring and controlling interference
- Licensing and regulating all radio stations
- Laying down equipment standards
- Negotiations with adjacent countries
- Contributing to discussions in ITU-R
- Coordinating the policy and proposals for WRC

[1] ITU uses the terminology Radio Administration which may not be the same body as the agency or department of government which implements and licenses the use of frequencies.

Aviation is a major operator of radio services and must coordinate closely with the national radio authority in all matters which affect the safe and effective operation of aeronautical radio facilities. This includes the licensing of ground stations, clearance of interference, input of the aviation position for WRC preparation, personnel radio licensing, legislation to control radiations that can interfere with aviation radio, and any other matter related to the use of frequencies.

Summary

This presentation has reviewed the institutional framework for spectrum management in the world as operated by the ITU. It is seen that there is an interlocking arrangement of activity which starts with the Treaty agreements in the International Telecommunications Union. These agreements set the scene, and the basic framework, from which a stable and workable formula can then be developed. This is the Radio Regulations which also attracts Treaty status. In this document the Table of Allocations defines the entire use of the frequencies in the useable radio spectrum. World Radio Conferences of the ITU, held every 2/3 years, amends the document as necessary. All world countries, some 186 in number, are signatories of the ITU Convention.

National Radio Authorities (NRA) hold full sovereignity in the use of frequencies in their territory, but the prescribed ITU agreements are invariably recognized and held. It is these NRA who license and police the frequency use in their country. In summary the key points are :

- The International Telercommunications Union (ITU) with 186 plus countries is the world wide treaty body for Telecommunications. The Union is a Specialized Agency of UN with a Convention and a Constitution as the definitive treaty documents. Over many years it has established a framework of regulatory and technical agreements which operates as a practical means of agreement for spectrum use throughout the world ;
- ITU World Radio Conferences are held every 2/3 years to undertake new agreements and to amend the Radio Regulations. The Regulations contains a Table of Allocations which is the detailed definitive document in which spectrum agreements are recorded.
- The ITU-R has an autonomous technical arm operating under the Radiocommunications Assembly which conducts technical studies and makes Recommendations to provide conferences with their technical bases,
- National Radio Authorities hold sovereign rights in the use of frequencies in their territories. Generally these are in accordance with the Radio Regulations

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