



INTERNATIONAL CIVIL AVIATION ORGANIZATION

**TWENTY-SECOND MEETING OF THE
ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG/22)**
Bangkok, Thailand, 5-9 September 2011
**Agenda Item 3: Performance Framework for Regional Air Navigation Planning
and Implementation**
3.4 CNS/MET
FREQUENCY SPECTRUM MANAGEMENT

(Presented by the Secretariat)

SUMMARY

Frequency spectrum is a critical finite resource which is being shared by many applications. As the developments take place all these applications, their requirement for frequency spectrum also increases. Allocation of frequency band and the needed regulatory arrangements are considered by ITU World Radiocommunication Conference. This paper discusses issues related to the rising competition between various applications for their share in the frequency spectrum. Paper also discusses spectrum management issues to provide an interference free operating environment.

This paper relates to –

Strategic Objectives:

*A: **Safety** – Enhance global civil aviation safety*

*C: **Environmental Protection and Sustainable Development of Air Transport** – Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-21 Navigation systems

GPI-22 Communication infrastructure

GPI-23 Aeronautical radio spectrum

1. INTRODUCTION

1.1 Radio frequency spectrum is a precious natural resource with finite capacity for which demand is constantly rising. It has been predicted that the demand for spectrum will continue to rise for all users that utilize radio waves, as the world economies progressively expand. The competition among the users for spectrum is hence expected to intensify in the years ahead. In this

competitive situation, even a sector holding a spectrum allocation will not have an automatic right to retain that radio frequency spectrum, as a decision by the International Telecommunication Union (ITU) World Radiocommunication Conference (WRC) may require the spectrum be removed from any radio service to meet a superior justified demand for another radio service.

1.2 Aeronautical spectrum use in the main frequency bands amounts to around 14% of the total available spectrum and can be divided into two main functions; air-ground communications and radionavigation. Progressively, satellite-based services are also getting included as an additional function. Due to the characteristics of the global allocation, aeronautical bands are sometimes the target and are attractive for new applications.

1.3 Aeronautical services have been recognized internationally to be the prime users of radio frequency spectrum without which aircraft operations would not be capable of meeting the global demand for safe, efficient and cost-effective transport. The safety-of-life element, present during all phases of flight is accorded special treatment internationally and is granted protection from harmful interference through agreed measures.

2. DISCUSSION

Spectrum sharing/surrender

2.1 With the rapidly developing new applications requiring spectrum allocation, congestion is now being faced by all the users. Every WRC sees an intense competition for share in various frequency bands. Next WRC is also likely to see a number of competing applications contesting for their share in different frequency bands. Some of the WRC-12 Agenda Items related to allocation of spectrum for recent developments are listed below:

- a) Agenda Item 1.3 – spectrum requirement and regulatory actions to support safe operation of unmanned aircraft system (UAS);
- b) Agenda Item 1.5 – Global harmonization of spectrum for electronic news gathering (ENG);
- c) Agenda Item 1.14 – Consideration of requirements for new application in the radiolocation service and review allocations for implementation in the range 30 – 300 MHz.;
- d) Agenda Item 1.15 – Consideration of possible allocation in the range 3 – 50 MHz to the radiolocation service for oceanographic radar applications;
- e) Agenda Item 1.21 – Consideration for a primary allocation to the radiolocation service in the band 15.4 – 15.7 GHz;
- f) Agenda Item 1.23 – Consideration of an allocation of about 15 kHz in parts of the band 415 – 526.5 kHz to the amateur service on secondary basis; and
- g) Agenda Item 1.25 – Consideration of a possible additional allocation to the mobile-satellite service (MSS)

2.2 Wireless Avionics Intra-Communication (WAIC), a new innovation, is now under development. WAIC proposes to utilize wireless technology for communicating between two or more nodes within the aircraft. The system is proposed to be used for enhancing aircraft operation without compromising safety. This system will replace hardwired nodes on board the aircraft, thus reducing the weight (because of wires), fuel consumption and hence the carbon emission. Current aeronautical services allocations may not be sufficient to permit the introduction of WAIC systems and hence additional allocation is being proposed for the consideration of next WRC.

2.3 Frequency spectrum, being finite in size and with no extra capacity available to accommodate these additional requirements, existing users will be under pressure to surrender/share their allocations with the new proposed applications. ICAO position on Agenda Item 1.3 agrees to accommodate the safety related requirements of UAS. It may however be mentioned that the updated ICAO position approved by Council at the third meeting of its 193rd Session on 15 June 2011 once again stresses that safety considerations dictate that exclusive frequency bands must be allocated to safety critical aeronautical systems (sharing to be avoided). It hence becomes necessary that frequency bands used for safety critical aeronautical systems remain exclusive and sharing of these bands be avoided.

2.4 Sharing of allocations at the national levels is promulgated through footnotes. Regarding the frequency bands which are being shared presently, WRC-12 Agenda Item 1.1 requires the Conference to consider and take appropriate action on request from administrations to delete their country footnotes through which sharing of frequency bands has been adopted. In line with ICAO policy of avoiding sharing of safety critical aeronautical frequency band, APAC Office, through its State Letter T 8/8.10:AP006/11 (CNS) dated 21 January, 2011 reminded the States that *'ICAO does not generally recommend the use of country footnote allocations in aeronautical bands to non-aeronautical applications on safety ground'*. States were therefore requested to review the allocations made in aeronautical frequency bands for non-aeronautical purposes and take up with the Regulators the possibility of maintaining exclusivity of usage of the aeronautical spectrum.

Interference

2.5 Intentional and un-intentional interference is fast becoming a matter of serious safety concern for the aviation community. This year beginning, the whole GNSS user community got deeply concerned with a technological innovation launched to provide a broadband network integrated with satellite coverage. The proposed system will combine existing mobile satellite communication services with a ground-based wireless communications network that uses the same L-band radio spectrum as the satellite. On 26 January, 2011, Federal Communications Commission (FCC) issued an Order and Authorization giving a conditional approval to build out its ground-based wireless network by reusing its authorized mobile satellite service (MSS) spectrum (1525 – 1559 MHz and 1626.5 – 1660.5 MHz) and transmit at Effective Isotropic Radiated Power (EIRP) of 72 dBw. (15.84 KW). Base stations of the network will transmit signals in a radio band immediately adjacent to the GPS frequency band (1559 - 1610 MHz). Tests have shown that the strong ground based transmissions will overpower the relatively weak GPS signals (around -130 to -147 dBm that is around $1 e^{-13}$ to $2 e^{-15}$ mw) from space, though the system will operate in its own band. The issue has attracted the attention of whole GPS user community.

2.6 CNS/MET Sub Group, in its Fifteenth meeting held from 25 to 29 July 2011 took up for discussion the issue of radio interference/jamming of GNSS and developed a draft Conclusion for the consideration of APANPIRG. Inadvertent interference sources including harmonics, inter-modulation products and parasitic oscillations can be mitigated through technical tools. Unintentional interference caused by inappropriate allocations in the adjacent frequency bands, interference caused by pseudolites (devices intended to supplement and aid GNSS services by transmitting GNSS compliant signals from a fixed ground location) or a genuine test signal generated from a test signal generator/simulator for the purpose of testing/maintaining GNSS devices can also

be mitigated using spectrum management techniques. Similarly the adverse effects on GNSS performance caused by repeaters used to receive GNSS satellite signals, amplifying them and re-transmitting them to provide GNSS services in the areas obscured from direct reception of GNSS can be minimized by restricting the coverage of the repeater signal. So there are mitigation techniques available for the interference caused unintentionally.

2.7 Deliberate interference, however is a more serious issue which needs to be dealt more firmly. Use of Jammers, the devices designed to deny GNSS services to a genuine receiver and spoofers, the devices designed to produce GNSS like signal with the intention of causing the GNSS receivers to output inaccurate and misleading information needs to be controlled. It may be mentioned here that performance of GBAS facility installed in Newark Liberty International Airport in 2009 was very seriously degraded by the low cost jammers installed in the commercial vehicles operating or parked in the vicinity. The monitors repeatedly picked up the jammer signals and switched the facility off.

2.8 Interference is sometimes observed on the air ground communication channels, radio navigation aids, surveillance systems from different applications both legitimate and illegitimate. It therefore becomes necessary to identify the source of interference and arrange to remove it using technical/regulatory methods. States are therefore required to develop technical and regulatory arrangements to ensure that interference free operating environment is ensured.

Handbook on Radio Frequency Spectrum Requirements

2.9 Fifth Edition (2010) of '*Handbook on Radio Frequency Spectrum Requirements for Civil Aviation*' (ICAO Doc 9718) has been published to assist the States in their national discussions on matters relating to the use of the radio frequency spectrum by international civil aviation. Nine chapters of the document cover the institutional aspects and the relationships between the main participants (ITU, ICAO, national authorities etc.), overview of spectrum management process, description of each frequency band together with ICAO policy on that band, corresponding radio regulations, future requirements of spectrum for civil aviation and elements of a framework of rules and preventive measures for the regulation and control of interference. Eight appendices provided in the document supplement the basic information in greater detail.

2.10 In order to ensure that interference free operating environment is continuously available for civil aviation and that adequate spectrum is available to meet the current and future requirements, it is essential that uniform and sound spectrum management techniques are adopted and implemented by all the States in the region. Guidance provided in radio frequency handbook (Doc 9718) can help the States in developing the required spectrum management technique and regulatory procedure.

3. RECOMMENDATION

3.1 Based on above the meeting is invited to consider adopting following Conclusion to support continuous availability of adequate spectrum without harmful interference to meet current and future civil aviation requirements:

Conclusion 22/xx – Frequency Spectrum Management

That, the States be urged to:

- a) consider avoiding sharing of aeronautical frequency bands for safety service with non-aeronautical applications and requesting for deletion of their country footnote or have their country name deleted from footnotes under WRC – 12 Agenda Item 1.1 in support of ICAO Position for this Agenda Item;
- b) consider developing technical and regulatory arrangements to ensure operating environment without harmful interference; and
- c) adopt guidance provided in *‘Handbook on Radio Frequency Spectrum Requirements for Civil Aviation’* (ICAO Doc 9718) for the development of a sound frequency spectrum management policy in the administration.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

- a) note rising competition amongst aeronautical and non-aeronautical application for their share in the finite frequency spectrum; and
- b) consider adopting Conclusion in section 3.1.

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