

ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

**Agenda Item 5 Review of the outcome of the ITU World Radio Conference (2003)
: (WRC-2003) and its impact on aeronautical electromagnetic spectrum
utilization**

INTERFERENCE INTO AERONAUTICAL RADIOCOMMUNICATION AND RADIONAVIGATION SYSTEMS

(Presented by the Secretariat)

SUMMARY

This paper presents areas of concern to international civil aviation with regard to interference issues. It reviews the various causes of radio frequency interference and proposes that ICAO should address these issues with urgency.

Action by the conference is in paragraph 4.

1. BACKGROUND

1.1 For many years interference in aeronautical radiocommunication and radionavigation systems has become an area of increasing concern to aviation. Interference can be categorized as interference generated by non-aeronautical radio frequency (RF) sources and interference from aeronautical RF sources, both in the aircraft and on the ground.

1.2 Interference becomes a concern to aviation when it exceeds the level for harmful interference. (Harmful interference is defined in the International Telecommunication Union (ITU) Radio Regulations as “interference that endangers the functioning of a radionavigation service or other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with these Regulations”). Interference that is below the level of harmful interference can, in general, be accepted. In this case however, the aggregate level of interference from various sources into a particular aeronautical communication or navigation system that can be present simultaneously needs to be considered and this aggregate level should not exceed the harmful interference threshold.

1.3 For the radio systems standardized in Annex 10, interference criteria have been established for the purpose of enabling their frequency assignment planning. Although these criteria can give an indication of the level of interference that can be accepted, the characteristics of other interference sources need to be examined carefully with a view to establishing RF-interference levels that are not harmful. (As an example, very high frequency (VHF) voice receivers are much less resistant to interference caused by digital signals than to interference caused by analogue signals.) Where possible, maximum interference levels should be established by tests with a representative selection of aeronautical radio equipment.

1.4 In the upcoming years these activities need to be increased and be given a higher priority, in order to secure that eventual regulatory provisions which are being developed take into consideration the need to protect on-board aeronautical communication and navigation systems.

2. INTERFERENCE FROM AERONAUTICAL SOURCES

2.1 Interference from aeronautical sources or between aeronautical systems can be considered as:

- a) interference as a result of band sharing between aeronautical systems; and
- b) interference between systems on board an aircraft.

2.2 The interference identified in a) is normally caused when different aeronautical systems are operating in the same frequency band or in adjacent frequency bands. The interference can be controlled by the aeronautical authorities and kept below the level of harmful interference by proper frequency assignment planning.

2.3 With respect to on-board interference (identified in b)), it is noted that in certain frequency bands, the number of systems planned to operate is increasing and creates difficulties in finding locations on the fuselage for the necessary antennas in order to avoid interference between these on-board systems. In particular the problem is difficult to solve if (low level) signals from one system are to be received at the aircraft while another system on the same aircraft is transmitting (high level) signals on a nearby frequency. If these problems can not be solved, it may become impossible to implement a new system. These aspects need to be addressed as a part of the process of developing Standards and Recommended Practices (SARPs) for a new system. The assessment should be undertaken by ICAO in coordination with the aviation industry. Existing systems, such as the VHF digital link Modes 2, 3 and 4 should be subject to a similar assessment.

3. INTERFERENCE FROM NON-AERONAUTICAL SOURCES

3.1 Interference from non-aeronautical sources can be categorized as follows:

- a) interference as a result of band-sharing between aeronautical and non-aeronautical services;

- b) interference from radio communication systems operating in bands outside the aeronautical frequency bands (such as FM-broadcasting); and
- c) interference caused by unintentional radiation of equipment using RF-energy (e.g. cable-tv distribution networks, industrial, scientific and medical equipment, on the ground and personal electronic devices (computers, audio equipment etc. carried and used by passengers).

3.1.1 The ITU is normally involved in establishing the necessary conditions to achieve compatibility between the services involved in order to secure safe operation of the aeronautical services and systems for the cases a) and b) above. To this effect, the ITU develops ITU-R Recommendations on the basis of studies presented. ICAO normally is invited to participate actively in these ITU studies and develops, as required, relevant SARPs and guidance material. ICAO's preparatory activities for these ITU meetings are, in most cases, concentrated in the ACP Working Group F and the GNSSP spectrum sub-group.

3.1.2 For c) above, the standardization activities normally take place in the telecommunication industry standardization organizations (global and regional). The cooperation between ICAO and these standardization organizations, and in particular the participation of ICAO in these bodies should be increased.

3.1.3 A special case of on-board interference caused by non-aeronautical equipment are the personal electronic devices (PED) carried on-board by passengers and used during flight. This includes portable computers, audio-equipment and computer games. Industry standards for such equipment are normally not established taking into consideration interference that can be caused when such equipment is used on board an aircraft. In addition, different aircraft may react differently on this type of interference. It is proposed that ICAO should assess whether (and if required, in what format) there is a need for developing relevant ICAO provisions, in addition to or as a complement to those developed by the industry. This activity may need involvement of airworthiness expertise.

3.2 Particular cases of critical concern to aviation are:

- a) the introduction of ultra-wide band systems; and
- b) on-board use of cellular telephone systems.

Ultra-wide band systems (UWB)

3.2.1 UWB systems operate in a wide frequency range (from 100 MHz up to 10 GHz) and are generally radiating with a low power. These systems are intended for unlicensed usage and can be used everywhere. These systems have the potential to interfere with essential aeronautical radio-communication and radio-navigation systems, in particular when considering the aggregate interference that may be generated when a large quantity of UWB devices are used in a relative small geographic area (e.g. a city). To study the potential of interference the ITU and the CEPT have created special group with the view to develop, relevant material in order to secure adequate protection for existing users of the RF spectrum.

Cellular telephones

3.2.2 Currently, airlines are encouraged to not allow the use of mobile telephones on board aircraft during flight. This however, results in different airlines having different policies with respect to such usage. It is considered necessary to identify if there is a need for further (ICAO) provisions on this practice, to ensure harmonized application of procedures regarding the use of cellular phones on board aircraft.

3.3 Work in ICAO on the protection of aeronautical frequency bands from harmful interference is concentrated in ACP-WG F, assisted by the GNSS spectrum subgroup, as required.

4. ACTION BY THE CONFERENCE

4.1 Noting the above, the conference is invited to agree on the following recommendation:

Recommendation 5/xx — Interference from non-aeronautical sources

That ICAO

- a) intensifies its activities on the protection of on-board aeronautical radio communication and radio navigation systems from harmful interference; and
- b) assess the need for the development of ICAO provisions relating to the use of PEDs and cellular phones on board aircraft.

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