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

CONTROLLING AERONAUTICAL FREQUENCY INTERFERENCE

(Presented by France)

SUMMARY

In France, aeronautical frequency interference is the cause of numerous radio system malfunctions. This paper presents the types of interference most involved along with the frequency bands that are most affected and the arrangements and means used to control these disturbances. The purpose of this paper is to make the aeronautical community aware of these recurrent problems, for which France is requesting that ICAO draw up Standards and Recommended Practices (SARPs) and produce a technical guide on the control of aeronautical frequency interference.

Action by the Conference is in paragraph 8.

1. INTRODUCTION

1.1 In the present context of high-density air traffic, it is increasingly important for the means used by France to ensure high-quality air traffic control over all of French territory to be reliable and operationally available.

1.2 Frequency interference of air/ground (A/G) communications, radio guidance and radar systems is often responsible for making such systems unavailable. They thus have a direct impact on the safety and regularity of air traffic.

1.3 In order to ensure the quality and integrity of signals transmitted on all its allocated frequencies, in addition to preventive measures, France has taken a number of organizational measures, and has put in place technical means to bring an end as quickly as possible to such frequency interference.

2. FREQUENCY BANDS AFFECTED

2.1 The frequency bands most affected by interference are the VHF 108-117.975 MHz band used for radio guidance systems and the VHF 117.975-137 MHz band used for air/ground (A/G) radio communications. The use of frequencies in the 136-137 MHz sub-band is practically impossible in over a quarter of the country, in northwestern France, owing to extremely frequent interference.

2.2 The 1 215-1 300 MHz band (primary radar) is affected as well, but to a lesser degree.

3. TYPES OF INTERFERENCE

3.1 Main sources from within the aeronautical community

3.1.1 The use of frequencies outside of their specified operational coverage area leads to interference between control frequencies.

3.1.2 Technical problems (radio failure or drift (ground or airborne)): The worst malfunctions are failures which result in permanent transmissions (from the ground or on-board) that can lead to situations dangerous for air traffic safety.

3.2 Main sources from outside the aeronautical community

3.2.1 The most frequently cited sources are poorly adjusted FM radio broadcasting stations (on the adjacent VHF band below, at 87.5-108 MHz) and “unauthorized” radio telephones in the VHF 118-137 MHz band.

3.2.2 More indirectly, interference can also be attributable to “mass consumption” equipment (portable TV antennae, satellite TV demodulators, various filtering systems, etc.), paging systems, amateur radio operators (transmission of TV signals), medium-voltage power lines (radiation due to defective insulators) and unauthorized equipment (HF microphones, etc.).

3.3 Malicious use

3.3.1 Every year the civil aviation services must deal with malicious users of these frequencies. While this type of disturbance is rare (three or four times a year), one or two cases have proved to be of particular concern, as the “intruder” sent consistent control orders to pilots.

4. CONSEQUENCES OF INTERFERENCE

4.1 Flight safety

4.1.1 In France, there have so far been no accidents recorded which resulted from frequency interference. Indeed, the measures taken by the control services or pilots (go-arounds when ILS indicators fluctuate) have always made it possible to ensure air traffic safety. But there is clearly a potential danger.

4.2 Traffic flow regularity

4.2.1 In some of the cases of interference mentioned above, the control services temporarily were forced to stop using frequencies having heady interference, thus reducing their control capacity and the air traffic flow specifically through the closure of certain sectors. In France, such measures have been responsible for up to 64 000 minutes of delays in one year.

4.3 Costs

4.3.1 Frequency interference involves a significant cost for air transport. Eurocontrol estimates the cost of one minute of delay at between 100 and 200 Euros.

4.3.2 Frequency interference is also costly for civil aviation operations because of the means that must be devoted to detecting its sources. For example, an hour of flight time of a laboratory aircraft costs about 1 000 Euros, and it takes at least five hours to determine the area from which interference originates.

5. STRATEGY FOR CONTROLLING INTERFERENCE

5.1 In order to control frequency interference, France has drawn up a strategy involving all the services concerned, including the Ministry of Defence, the French Frequency Agency, the Directorate General of Civil Aviation and broadcasters, and which is based on two major types of activity:

5.2 Preventive action

5.2.1 This is directed at the whole of the aeronautical community and aims at raising awareness among all those involved of the potential risks for civil aviation associated with frequency interference, and at informing them of known ways to improve the situation.

5.2.2 Outside activities are conducted to eradicate potential sources of interference by preventively monitoring the spectrum.

5.2.3 Legal action is taken against offenders.

5.3 Remedial action when interference is encountered

5.3.1 France has ground and airborne equipment for the detection of interference sources.

6. MEANS USED TO CONTROL INTERFERENCE

6.1 Stationary ground-based means of interference detection

6.1.1 A 24-hour monitoring system has been set up at the largest airports in metropolitan France. It currently ensures real-time monitoring of the 108-137 MHz aeronautical frequency band over a radius of 40 kilometres around the airports.

6.1.2 Airport radio direction finders are also used for detection.

6.2 Mobile means of interference detection

6.2.1 This equipment allows the technical services concerned to search for VHF/UHF frequency interference. It is used either in vehicles (such as an ILS maintenance vehicle) or "hand-held" during the final stages of interference detection.

6.3 "Airborne" means of interference detection

6.3.1 However numerous they may be, the fact that ground-based listening stations have an operating radius of 40 kilometres leaves vast areas unmonitored, and much of the interference reported by pilots in flight is not detected on the ground. Interference reported by an aeroplane at flight level 300 can originate from a source located within a radius of 200 NM. It is thus crucial to be able to carry out investigations from the air to attempt to detect the problem, analyse it and define a search area for mobile teams on the ground.

6.3.2 For such interference detection and for VHF/UHF aeronautical band monitoring, France has an ATR 42 and a Beech 90 equipped for aeronautical frequency band listening. The Beech 90 also has a VHF/UHF radio direction finding system.

6.3.3 Additionally, thanks to the French Frequency Agency, France has mobile detection vehicles with listening and radio direction finding capabilities and (approximately) 50 automated listening stations located in the vicinity of major population centres.

6.4 Means to control GNSS interference

6.4.1 The French Directorate General of Civil Aviation does not currently have any specific technical means for controlling and detecting interference on GNSS frequencies. However, studies are under way to determine which tools are required in order to validate the use of approach procedures using GPS on the one hand, and on the other hand to control GPS interference.

7. CONCLUSION

7.1 The (ground and air) means used by France (targeted or continuous clean-up programmes) have made it possible since 1999 regularly to reduce the number of frequency interference reports.

7.2 However, while the number of cases reported in France is low, frequency pirates pose a serious risk to air traffic safety.

8. ACTION BY THE CONFERENCE

8.1 The Conference is invited to:

a) take into consideration the recurrent problems posed by aeronautical frequency interference;

b) draw up SARPs for frequency interference control; and

c) assign to a group of experts the task of producing a guide or technical document on the control of interference, so as to assist States in implementing the appropriate means.

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