Aviation and the RF Spectrum Challenge

Report on the Conference held at Toulouse, France, 30-31 January 2003, under the auspices of the French Minister of Transport

This is a crucial challenge for Aviation. Radio frequency spectrum is a common resource whose use is nonetheless limited by the laws of physics. Frequencies are used to provide : ground **C**ommunication; **N**avigation made possible by electrical aids; **S**urveillance by ground control. These functions are collectively known as “CNS”, and are essential to safety and flight operations. As such, they contribute to the regularity of air transport whose increase has effectively exercised a considerable leverage on the national economies. Alongside these CNS frequencies serving the “cockpit” – operated by the pilot and increasingly sophisticated on-board air assistance systems – the industry is witnessing the emergence of a real demand for other forms of communication with the ground, in favour of the passenger. Air companies are making efforts to offer new passenger services : e-mail, Internet access, “on-demand video”, etc., all of which require significant bandwidth. However, the anticipated benefits are expected to make a positive contribution to the overall profit of their operation.

The use of aeronautical frequencies is subject to a development which raises a number of questions. These frequencies are ever more frequently scrambled, both for random and malicious reasons. Such types of scrambling incidents interfere with aeronautical navigation and communication operations, and thereby have a direct impact on the safety and regularity of air transport. Secondly, developments in telecommunication and signal processing technologies are accelerating, with a two-fold promise assuring more efficient usage and possible sharing between a number of users of this limited spectrum resource. However, for such a promise to come true it would be necessary to carry out a number of long studies and in-depth checks in order to reduce the scrambling. Lastly, other sectors of economic activity are calling for an ever larger share in spectrum resource, aiming in particular to introduce new services and systems in the aeronautical bands, which are extremely attractive due to the global nature of their attributions such as they are defined by ITU communication regulations. In the meantime, the players in the telecommunication field – industrialists and operators – not only have the interests and obligations in the divergent matters of safety but also an economic weight, giving far greater lobbying power than that enjoyed by aviation.

These considerations were treated in some depth during the “Aviation and the RF Spectrum Challenge” conference held on 30-31 January this year at Toulouse, co-organised by the AAAF and the SEE (see attachments providing a selection of presentations). This conference covered the subject in terms of usage and limitations of frequencies whose most notable recent developments are characterised by :

1. The increase in traffic which, despite being affected by a slow-down following the tragic events of 11 September 2001, seems likely to start up again. Taking into account this increase, it is necessary to put into operation an ever greater number of telephone links between pilots and controllers. Whilst its main support, the VHF band, will be congested in Europe within the next decade to come, even if the channelling applied to this band is passing from 25 to 8.33 kHz, thus multiplying by 3 the number of allocations made possible by frequencies in this band (in theory, since numerous restrictions mean that in practice, equipment with 25 kHz allocations can not be converted into 8.33 kHz)
2. These days the limit of aviation frequency management efficiency has been reached within a purely national context, since, in terms of priority allocation of requests for new frequencies, practice within states differs enormously from one European state to another. Furthermore, current coordination between different countries tends to treat a request for a high capacity route sector frequency on the same level as one for an information service linked to an aerodrome of secondary importance. In addition, the allocations obtained are not put into operation as quickly as others, and some of them even lie fallow.
3. For more than half a century there has been a proliferation of ground-onboard radio installations, resulting in a forest of antennas to install on an aircraft structure, due to the

electromagnetic compatibility and aerodynamic drag requirements. Yet even when the new CNS installations appear on the aviation scene, the heterogeneity of the global air fleet, with regard to type of material and age, means that it is almost impossible to remove the old systems, despite them being advantageously replaced by new ones in functional and operational terms.

3. The bands allocated to aeronautical navigation and localisation services are currently threatened by scrambling due to new entrant services, already (or soon-to-be) authorised by the WRC (World Radiocommunication Congress) in 2000 or in the near future . This is the case of the 2.7-2.9 GHz band (the so-called "S-band") used by aerodrome approach radars. These are extremely vulnerable to unwanted emissions of cordless systems of the 2.4 GHz radio-LAN type and the UMTS type in its extension band (2.5-2.7 GHz), due to the absence of selectivity in their low-noise entry level. Furthermore, their protection by filter could have resulted in a reduction in radar range). The case of the 1215-1300 MHz band (the so-called "L-band") used for long-range radars, can be added. This is likely to be scrambled by the navigation-by-satellite systems, GPS and GALILEO, according to final decisions likely to be made at WRC'2003, following initial decisions at WRC'2000.

Faced with this situation, the aviation industry must react. Some progress has been achieved along these lines at this Conference, both on the technical level, as well as on the regulatory and lobbying level.

CONFERENCE PROGRAMME SUMMARY

First Session: Frequencies and Spectrum Issues

1.1 Band sharing between terrestrial and satellite-based navigation systems : specific case of the European GALILEO System (H. de BAILLIENCOURT- ANFR & B. ROTURIER - DGAC/STNA)

1.2 *Impact of radio regulation changes onto radar systems and technology development (T. JURAND & D. LE MEIL –THALES)*

1.3 *The aircraft antenna installation puzzle* (C. PICHAVANT - AIRBUS France)

1.4 *Aeronautical bands and services allocation, through the ITU regulatory and study-group work processes* (E. FOURNIER - ANFR)

1.5 *Foreseen VHF band saturation for the aeronautical radio communications in Europe* : *the supply-versus-demand evolution for ATC frequency-assignments, as simulated in the years ahead* (A. ASTORINO – EUROCONTROL)

1.6 *The French Civil Aviation Authority plan of actions to combat radio interference in the aeronautical frequency bands* (D.LEMARCHAND - DGAC/DNA, J.L. SULEK – DGAC/SCTA)

1.7 *Telemetry for Airbus Aircraft (J. C. GHNASSIA – AIRBUS FRANCE)*

1.8 *Benefits from advanced simulation techniques for the evaluation of radio systems performance in spectrum sharing studies* (J. LEMORTON - ONERA)

1.9 *Aircraft passenger communications and multimedia services* (A. FONTAINE – Airbus/Fr ; L. SIGNARGOUT - ROCKWELL COLLINS/Fr)

Second Session: Possible Way Forwards

2.1 *Multi-purpose and multi-functional radiating structures in military system development* (M. SOIRON (TBC) - THALES)

2.2 *Terrestrial and satellite systems complementarity : how to migrate spectrum - starved VHF communications to SATCOM while maintaining high quality of services to both aircrews and controllers* (M. DABIN - ALCATEL, C. LOISY - ESA, P.RENAUD - EUROCONTROL)

2.3 The fully digital radio : status of concept development (E. J. CALHOUN – ROCKWELL COLLINS)

2.4 Defence Systems long term evolution, in the context of increased telecommunications market forces and evolving radio regulatory environment (Contre Amiral J. BIZARD - BMNF)

2.5 The Boeing Air Traffic Management initiative and the aviation spectrum challenge (F. GAMBA-BOEING/Europe

2.6 Satellite-based Communications, Navigation and Surveillance for ATM : opportunities and challenges for Europe, in particular in the radio-frequency arena (B. MATHIEU – CNES)

2.7 The European ministers of transport decision on matters of aviation frequencies and spectrum defence (G. BAILEY –EUROCONTROL)