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WORKING PAPER

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Agenda Item 1: Strategic issues that address the challenge of integration, interoperability and harmonization of systems in support of the concept of "One Sky" for international civil aviation
1.1: Global Air Navigation Plan (GANP) – framework for global planning

SPECTRUM MANAGEMENT

(Presented by the Presidency of the European Union on behalf of the European Union and its Member States[1]; by the other Member States of the European Civil Aviation Conference[2]; and by the Member States of EUROCONTROL)

SUMMARY

This paper presents the spectrum management principles and strategic objectives to be supported by an ICAO comprehensive aviation frequency spectrum strategy in order to secure the timely availability and adequate spectrum protection for the provision of air ground communication, navigation and surveillance present and future systems.

Action: The Conference is invited to agree to the recommendation in paragraph 8.

1. FOREWORD

1.1 As the environment within which aviation operates changes to reflect global developments, the States and industry need to react to ensure that it can continue to meet its safety and operational requirements. Increasing demand for spectrum from non-aviation sectors is placing aeronautical spectrum at risk and it is essential that aviation acknowledges this threat and works to protect itself. Within Europe, through the close cooperation across States and organizations within the ASFCG[3], the introduction of new arrangements originating from the Single European Sky framework and the SESAR programme, and as a consequence of having to react to regional spectrum management influences, considerable progress has been made in helping to protect aeronautical spectrum. However, this is not simply a regional issue but one that affects the global aviation sector, and is therefore a topic of significant interest to the AN-Conf/12.

[1] Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. All these 27 States are also Members of ECAC.

[2] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Iceland, Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

[3] The Aeronautical Spectrum and Frequency Consultation Group (ASFCG) established in 2002, comprises high-level representatives from ECAC State aviation authorities, air traffic service providers and radio regulators, as well as international organizations such as EUROCONTROL, the European Commission, NATO and IATA.

2. INTRODUCTION

2.1 Air traffic management relies on having access to suitable radiocommunication systems for the provision of air ground communication, navigation and surveillance with the relevant levels of availability and reliability. These radiocommunication systems are reliant on the provision of sufficient spectrum that is suitably protected. The requirements are expanding as aviation looks at new applications such as data link, weather applications, and remotely piloted aircraft systems.

2.2 In 1947 the Radio Regulations[4] were revised and the frequency range of applicability was extended from 200MHz to 10 GHz. At its inception ICAO through its Contracting States, was far sighted and managed to reserve a number of frequency bands for future aeronautical systems and – save for a number of minor changes – these bands are those within which aviation operates its systems today.

2.3 Since 1947 aviation has developed and standardized a number of systems, some of which had been intended as replacements for older systems. However as operational procedures were designed around the expanding communications, navigation and surveillance (CNS)[5] toolset, these older systems were never formally retired. Hence such systems have not been removed from aircraft and in various parts of the world they continue to be used.

3. SPECTRUM RISKS

3.1 Perception of Aviation

3.1.1 Spectrum has become an increasingly scarce resource as demand from other sectors, particularly mobile communications, grows. Consequently, radio regulators and those seeking additional spectrum, while ignoring the major criteria of aviation continuity of services and reliability requirements, have looked closely at other major spectrum users, such as aviation, to determine how efficiently they use their allocations. Regrettably, the perception gained from these considerations is that aviation is not an efficient spectrum manager or user.

3.1.2 Aviation was able at an early stage to gain exclusive frequency allocations in what is now considered to be the radio spectrum where the trade-off between performance and cost is optimal for all terrestrial systems. This, along with the globally harmonized nature of aeronautical spectrum which significantly adds to its economic value, has made it a prime target for those seeking access to additional spectrum allocations, and the traditional aviation rationale for spectrum use is under increasing challenge.

3.1.3 In the past, aviation has been able to defend its spectrum allocation primarily on safety grounds, but those arguments are perceived as less convincing by non-aviation sectors, for which economic considerations are increasingly used as a basis for decision making. To date the damage has been limited to a loss of exclusive access in a limited number of frequency bands. Although access to the frequency bands affected and protection of the systems operating in those frequency bands have been maintained through the introduction of appropriate regulatory measures, capacity and freedom of use have nonetheless been lost.

3.1.4 Aviation has determined that aeronautical safety of life radio systems operate in spectrum that is either allocated to or specifically identified for aeronautical services where it is recognized that additional safety margins are required when studying compatibility. However there is growing political and economic pressure to allow solutions using commercial systems to operate in “non-safety” spectrum despite the fact that such systems are not robustly regulated in the same way as aeronautical “safety of life” systems and frequently rely only on a voluntary, commercially-motivated cooperation between operators. If supported this would set a precedent that if applied to other frequency bands allocated to aeronautical services could have a significant impact on their use.

[4] The UN treaty defining how the radio spectrum is to be used internationally

[5] CNS refers to all communication, navigation and surveillance systems including new applications such as data links and remotely piloted aircraft.

3.1.5 As evidenced by the recently agreed agenda for the 2015 World Radiocommunication Conference (WRC), aviation spectrum will continue to be targeted by those seeking new spectrum. The WRC/15 agenda has four items that are a direct threat, and five issues which are a potential threat to aviation use, including additional spectrum for large capital industries such as those in the mobile telecommunications/broadband sector.

3.1.6 If aviation is unable to ensure the access to the spectrum required to support both in-use and future CNS systems, then there will be an impact on the capacity of the overall air traffic control system.

3.1.7 It is essential that a strategic approach to existing and future use of spectrum allocated to aviation is adopted, in order to ensure the protection of aeronautical frequency bands on a global basis.

3.2 Interference from Non-ATM systems

3.2.1 As radio spectrum has become more congested so the pressure to allow systems to operate closer to the technical compatibility limits, whether within the same or in an adjacent frequency band, has increased. Where this has involved aeronautical bands, aviation has sought to ensure the protection of aeronautical systems through the introduction of regulatory measures based upon theoretical and, as far as practical, compatibility studies. Such protection has not always been assured, normally due to unforeseen issues arising in practice when actual systems are taken into account, and then the subsequent interference threat has had to be addressed. In some cases, this has been due to shortcomings in the design of aeronautical systems, for example the current work being carried out to resolve the incompatibility between primary radar and mobile broadband communications around 2.7 GHz.

3.3 World Radiocommunication Conference Process

3.3.1 WRCs are the only mechanism available within the ITU to amend the Radio Regulations. The process operates on a four-year cycle, whereby agenda items to be dealt with at one Conference are agreed by the preceding one. Aviation is reliant on this process[6] to effect any change it wishes to see in the Radio Regulations and to ensure that the spectrum allocated to aeronautical services has the requisite regulatory protection. If aviation were to identify a spectrum requirement today the earliest it could be addressed within the WRC process would be 2018, assuming that an agenda item could be agreed at the next WRC (WRC/15). This would potentially give a system deployment date of around 2030. A WRC may also agree to reduce aviation's access to certain bands if that were the decision of the ITU Member States, despite aviation representation to the contrary.

3.4 Resources

3.4.1 Spectrum used by aeronautical systems is split across a significant number of widely separated frequency allocations, many of which are in bands that are regarded as offering the best compromise between performance, coverage and cost for many different radio allocations. These bands are extremely attractive to those seeking new spectrum allocations and can become the subject of studies across a large number of groups at national, regional and global level. As a result, the spectrum management resources that aviation can deploy are stretched and there is an increased risk of threats and issues not being identified at an early enough stage to ensure an effective input. It is essential that sufficient resources are made available by aviation at technical and regulatory levels in the ITU WRC preparatory cycle.

4. EXTERNAL CONSTRAINTS

4.1 Government Spectrum Release Programmes

4.1.1 Spectrum has become a valuable scarce resource which Governments view as a growth-enabler as well as a source of income. There is a growing trend for Governments to seek to identify spectrum that can be released for commercial applications such as mobile communications, in order to promote growth and raise

[6] Aviation authorities are not part of ITU and State delegations need to be properly informed in order to take care of aviation interests.

capital. Government spectrum holders such as the military and aviation are seen as spectrum rich and are therefore being pressured to release spectrum. Thus in the United States and the United Kingdom a target has been set for the release of at least 500 MHz of spectrum held by Government agencies. Spectrum used for aeronautical purposes is considered as a strong candidate by Government agencies due to its global nature, perceived use and the frequency bands employed.

4.2 Spectrum Pricing

4.2.1 As a means of incentivising more efficient spectrum management, there have been some significant proposals to use market mechanisms as the means to change demand behaviour for scarce spectrum. Whilst these measures may have benefit in purely commercial markets, their application in sectors such as aviation where demand is driven by safety and operational requirements within an international context raises issues. However, some administrations have an aspiration to include aeronautical spectrum in their spectrum pricing proposals and this is already beginning to have an effect in some countries. Although pricing may not be introduced on a widespread global basis, it may have a significant impact on costs.

5. SPECTRUM MANAGEMENT STRATEGIC OBJECTIVES

5.1 Aeronautical spectrum managers act as the interface between aviation and its aspirations with respect to radiocommunication systems and the radio regulatory process that has to meet the requirements of all of the interested parties. In order to maximize the return from the radio regulatory process, aeronautical spectrum managers have to deliver the following strategic objectives:

a) timely availability and appropriate protection of adequate spectrum to create a sustainable environment for growth and technology development to support safety and operational effectiveness for current and future CNS systems and allow for the transition between present and next generation technologies;
b) demonstrate efficient use of the spectrum allocated through efficient frequency management and use of best practice;

c) develop credible arguments to support aeronautical spectrum use; and

d) minimize the impact of market mechanisms on aviation.

6. DELIVERING THE STRATEGIC OBJECTIVES

6.1 To ensure the delivery of the strategic objectives identified above, it will be essential that aviation, as a global sector, works together to ensure that aviation has a spectrum strategy that:

a) resources spectrum management activities appropriately;

b) coordinates within and across regions on spectrum management activities to present consistent and robust rationale;

c) ensures that appropriate protection criteria are defined for aeronautical systems; and

d) within CNS strategies, clearly defines the rationale for the introduction of new technologies, particularly where there is a perception of duplication, and ensures that sunset clauses are defined to remove needless redundancy and obsolescence. At the contrary to the telecom industry, it is necessary to have redundancy to ensure continuity of service.

7. CONCLUSIONS

7.1 Spectrum is fundamental to safety and operational effectiveness in aviation. It is essential that aviation maintains access to sufficient, suitably protected spectrum to support the current and future global air traffic management system. In order to achieve this, aviation needs to continue to be engaged in the radio regulatory process, with sufficient resources to ensure that future aviation spectrum needs are recognized and serviced, and that potential threats are identified and addressed.

7.2 In order to ensure that aviation maintains a credible and relevant position in global spectrum management activity, it is essential that it presents a robust rationale to support its safety and operational requirements. In particular, strategies for new CNS developments need to ensure duplication is fully justified where appropriate and that the introduction of new technologies is combined with sunset clauses for those they are replacing. In this way, aviation can demonstrate clear strategic thinking and reasoned argument which supports its positions in the spectrum debates. In addition, aviation must continue to work towards efficient frequency management through best practice to strengthen the industry's reputation and avoid weakening its position in defending spectrum usage.

7.3 In the longer term aviation needs to work towards an air traffic management system that is reliant on the minimum number of globally harmonized CNS systems with the appropriate level of availability and reliability needed to meet the operational requirement. This should be reinforced by cohesive ATM and spectrum strategies. Initiatives such as the establishment of the role of Network Manager in Europe and the revised Global Air Navigation Plan based on the notion of aviation system block upgrades proposed by ICAO are, therefore, examples of measures being taken that should assist in this process.

8. RECOMMENDATIONS

8.1 The Conference is invited to:

a) make a clear statement about the need for aeronautical systems to operate in spectrum allocated to an appropriate aeronautical safety service. Among the types of aeronautical services (e.g. ATC, AOC, etc.), this statement should clearly identify that safety services have priority access, including appropriate regulatory protection;

b) ensure that the minimum set of global CNS systems required to meet aviation's safety and capacity requirements is clearly identified; that where necessary duplication exists, reasoned justification is provided; and that, when new systems and technologies are introduced, implementation strategies clearly define sunset clauses to phase out older systems where this is feasible;

c) invite ICAO, regional organizations and Member States to work together to deliver efficient frequency management and "best practice" to demonstrate the effectiveness and relevance of the industry in spectrum management;

d) invite ICAO, its Member States and operational stakeholders to develop and implement a comprehensive aviation frequency spectrum strategy based on the objectives detailed in paragraph 5, supported by a work programme with adequate resources to prepare for WRC/15; and

e) agree that the Global Air Navigation Plan and the aviation system block upgrades be used to implement the above recommendations.

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