Mobile Services on Aircraft

Discussion paper on the introduction of mobile services on aircraft

Publication date: 10 April 2006

Closing Date for Responses: 23 June 2006
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive summary</td>
<td>1</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>3</td>
</tr>
<tr>
<td>2 Background</td>
<td>5</td>
</tr>
<tr>
<td>3 International Approach</td>
<td>9</td>
</tr>
<tr>
<td>4 Mobile services on aircraft and wireless telegraphy licensing</td>
<td>15</td>
</tr>
<tr>
<td>5 Legal issues</td>
<td>19</td>
</tr>
<tr>
<td>6 Technical issues</td>
<td>24</td>
</tr>
<tr>
<td>7 Conclusion</td>
<td>28</td>
</tr>
<tr>
<td>8 Summary of questions</td>
<td>29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annex</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Summary of technical study in ECC WGSE</td>
<td>30</td>
</tr>
<tr>
<td>2 Radio and Telecommunications Terminal Equipment Directive – Article 3</td>
<td>33</td>
</tr>
<tr>
<td>3 General Conditions of Entitlement</td>
<td>34</td>
</tr>
<tr>
<td>4 ITU Radio Regulations - Licensing Condition</td>
<td>36</td>
</tr>
<tr>
<td>5 Glossary</td>
<td>38</td>
</tr>
</tbody>
</table>
Foreword

Executive summary

Ofcom manages the civil radio spectrum in the UK. Its duties include securing the optimal use of the electromagnetic spectrum, while having regard to the desirability of promoting competition and the development of innovative services.

Ofcom has been approached by stakeholders from the avionic and telecommunications sectors suggesting that it should review the wireless telegraphy licensing regime in order to permit the provision and use of mobile services on aircraft. There are a number of legal, regulatory and technical issues within Ofcom’s responsibilities which need to be considered and resolved: this paper opens the discussion among stakeholders about these.

However there are a number of other issues, outside Ofcom’s field of responsibility, which must be dealt with before any such services could be provided. Aircraft safety is of primary importance, and ensuring that this is in no way compromised is the responsibility of the Civil Aviation Authority. The human dimension of ensuring passenger safety and welfare is also the responsibility of the CAA. The proposed services would have to satisfy the CAA’s requirements before they could be introduced. Finally, if such services were permitted, it would be a commercial decision for airlines whether to offer them or not, taking into account the needs and preferences of their customers.

This paper covers only the issues relevant to Ofcom’s area of responsibility; and focuses exclusively on the specific issues raised by mobile services on aircraft. Its purpose is to generate discussion and invite comment on the issues identified by Ofcom at this stage as being relevant to such services.

Ofcom has been working with colleagues from other European countries towards a common approach to these issues and expects the consideration of the many complex issues raised to be completed within a reasonable timescale. Ofcom therefore believes that it is timely to publish this discussion paper and to seek comment from stakeholders and other interested parties. This paper is not intended to constitute a formal consultation.

The key issues addressed by the paper are of a technical, regulatory and licensing nature.

Regulatory issues raised in the paper are:

- the territorial jurisdiction of Ofcom and other National Regulatory Agencies over airborne systems;
- the legal status of the proposed Network Control Unit under the R&TTE Directive;
- the status of airborne services under the Authorisation Directive;
- the protection of other services from interference
- the regulation of the backhaul from aircraft to ground;
- the arrangements for managing the systems in the air;
- access to numbering resources;
- the range of technologies covered by the current European work.
Mobile Services on Aircraft

The main technical issue raised is how to ensure that airborne systems do not create harmful interference to terrestrial systems.

Licensing issues raised are:

- the options for authorising such systems; and
- who should hold such authorisations.

The ubiquity of GSM technology in Europe leads proponents of airborne mobile services to favour 1800 MHz GSM for the initial service. The legal, regulatory and licensing options covered by this paper may also be applicable to other mobile communication standards in due course; although some of the technical details will need to be re-worked in the context of those other standards.

Ofcom looks forward to learning the views of stakeholders on these topics or any others which they believe are relevant to the regulation of airborne systems. Ofcom will provide further opportunities for discussion with stakeholders: the outputs from these and from the European groups working in this area will inform Ofcom in developing specific proposals which will be issued for consultation at a later stage.

The CAA and other regulatory bodies will consider separately the safety and other issues raised by the proposed services. The introduction into use of any services cannot be contemplated until the requirements of those bodies have been satisfied.
Section 1

Introduction

Purpose of the paper

1.1 Under the Communications Act 2003 and Wireless Telegraphy Act 1949 Ofcom is responsible in the UK for securing the optimal use of the electromagnetic spectrum and, in doing so, must have regard to a range of considerations, including the desirability of promoting competition and the development of innovative services. Ofcom is also responsible for authorising all civil radio applications.

1.2 Ofcom has been approached by a number of industry representatives from the avionic and telecommunications sectors requesting that it give consideration to whether to issue wireless telegraphy licences to permit the provision and use of GSM (Global System for Mobile communications) services on aircraft. It must be stressed that this paper is only looking at the possible introduction of services using GSM at 1800 MHz on aircraft.

1.3 Such parties are interested in providing mobile communications on aircraft for use by passengers. Their proposals, which are based on customer service surveys, envisage the provision of a service that makes use of the handsets used in the terrestrial mass market for mobile telephony. As GSM is the dominant 2G technology, there is a focus on developing an airborne system that caters for GSM, with 1800 MHz as the first market to be served.

1.4 Ofcom notes that the proposals raise a number of complex issues, some of which fall outside the area of Ofcom’s responsibility. As regards those issues for which Ofcom is responsible, this paper aims to provide an initial overview which is designed to encourage interested parties and stakeholders to share with Ofcom their views as to how these matters might be addressed.

1.5 Other issues which must be resolved before these systems could be authorised fall within the remit of other regulatory bodies, in particular the Civil Aviation Authority which is responsible for aeronautical safety issues in the UK. Ofcom understands that the CAA is undertaking a separate evaluation of the technical issues raised by the possible introduction of mobile services on-board aircraft. Whilst Ofcom is not responsible for safety matters, it regards these matters as being of paramount importance and therefore will not seek to authorise the proposed technology until the CAA is satisfied of the safety issues raised by the systems in question.

1.6 Even if the issues raised by the CAA and Ofcom are satisfactorily resolved, Ofcom notes that it would be a commercial decision for each airline as to whether they consider that passenger demand exists at such a level as to warrant the supply of mobile telephony onboard.

1.7 At present the only mobile service under consideration for deployment on aircraft is GSM using frequencies at 1800 MHz, and all the work going on in European forums is focused on this service. This paper is therefore also focused on the 1800 MHz service: Ofcom expects that if the issues arising around 1800 MHz can be satisfactorily resolved, then those around other services, such as 900 MHz GSM and 3G, might be resolved at a later date.
1.8 This is a discussion paper that outlines the key issues and alternative approaches that Ofcom might take to resolve the regulatory issues for which it has responsibility. Ofcom has no formal policy position on these matters at present and invites comment and active engagement from stakeholders. This paper is one element of a programme to stimulate discussion and garner evidence and opinions from stakeholders on the issues raised and any other issues which may be relevant. This paper is not intended to constitute a formal consultation.

1.9 Readers of this paper are invited to comment on the contents and to propose other topics which should be considered.

Next steps

1.10 Further elements of the policy development process will be announced in due course. Technical and regulatory discussions are in progress in Europe and worldwide: Ofcom will consider these alongside contributions from UK stakeholders to this pre-consultation phase. Ofcom intends in due course to issue a formal consultation document with specific proposals to determine the final policy that should be followed. This consultation document will include an impact assessment considering all relevant options.

How you may engage in this process

1.11 Those wishing to contribute to this process should contact Richard Young in writing at:

Ofcom
Riverside House
2a Southwark Bridge Road
London
SE1 9HA
Email: richard.young@ofcom.org.uk

The closing date for contributions is 23 June 2006

1.12 All responses will be published on the Ofcom website unless specifically marked confidential.

Structure of this document

1.13 This document sets out Ofcom’s understanding of the complex issues surrounding the potential launch of GSM 1800 MHz services on aircraft. Section 2 sets the background and outlines the current restrictions on use of mobile phones on aircraft. Section 3, the International approach, outlines the ongoing work in worldwide and European forums to reach common positions on the key issues. Sections 4 and 5 provide an overview of the principal regulatory and legal issues, the options for dealing with them and some of the pros and cons as Ofcom currently understands them at this time and section 6 provides an overview of technical concerns. Readers of the document are invited to contribute their own views about these matters and to suggest other topics which Ofcom should be considering.
Section 2

Background

Introduction

2.1 Proponents believe that there is an opportunity to open a new market for mobile services on aircraft that could have significant consumer benefits. This new market opportunity builds on the ubiquitous usage of GSM (Global System for Mobile communications) handsets in Europe and consumers’ expectation of being contactable anywhere, anytime. GSM network subscribers would be able to use their own personal mobile equipment (phones, laptops etc) in-flight for voice text and other communication services.

2.2 Ofcom’s preferred approach to new opportunities of this kind is to allow the market to determine the business case and the right technical approach. However in this case there are issues of regulatory and technical policy which have to be resolved before services can be launched. Some of these are the responsibility of Ofcom, although others are the responsibility of other regulatory authorities. Unilateral assessment and determination of these issues may not be appropriate given the international nature of the services in question. Ofcom’s preference has up to now been to contribute to an internationally agreed solution to be implemented on a common basis by the regulatory authorities in many countries.

2.3 In the UK Ofcom is responsible for managing the radio spectrum used for civil purposes. By agreement with Ofcom, the Directorate of Airspace Policy ((DAP) a directorate of the Civil Aviation Authority) manages the aeronautical radio spectrum in the UK, recognising that there is a direct link with the management of the airspace. Ofcom has also contracted the DAP to administer Wireless Telegraphy Act radio licences for aircraft, aeronautical ground stations and navigation aids. The Civil Aviation Authority (CAA) is a public corporation, charged by the Government with regulating all aspects of aviation in the UK.

2.4 In the case of the 1800 MHz spectrum, and other bands used for terrestrial communications, Ofcom retains the primary responsibility for setting policy and determining the technical parameters needed to avoid harmful interference to other licensed users. Ofcom will work closely with the CAA to implement a licensing and technical regime which ensures that radio equipment can be used safely in its intended environment without causing interference to other systems and users.

Current UK position

2.5 At present the use of mobile telephony equipment on aircraft is not permitted in the UK due to the potential of interfering with essential on-board systems.

2.6 Given that aircraft operate in a potentially hazardous environment, many of their systems are safety devices intended to reduce the risks of operating in that environment. Anything that reduces the effectiveness of these systems will increase the potential danger to the aircraft and passengers. At present the use of mobile telephony equipment on-board aircraft presents a potential source of uncontrolled electro-magnetic radiation that may interfere with and adversely affect the aircraft’s systems. To this end all reasonable measures must be taken on-board aircraft to prevent the use of any portable electronic device (PED) (this includes mobile telephony) that could adversely affect the performance of the aircraft or its systems.
Evaluation of these risks and management of the regime to regulate them is the responsibility of the CAA.

2.7 A number of companies are now proposing GSM systems for aircraft which may be able to overcome the safety concerns of the relevant authorities (the CAA in the UK) by developing technical solutions to control the electromagnetic environment in the aircraft cabin to remove the possible interference issues. Ofcom and similar regulatory authorities in Europe and worldwide are considering the issues that such systems would raise within their areas of competence. In essence these key issues are:

- the legal principles supporting authorisation;
- the technical requirements to avoid harmful interference to other spectrum users; and
- the authorisation regime that should be applied.

How the new system might work

2.8 The following diagrams (Figures 1 & 2) shows an overview of the systems being proposed: an on-board cell is linked to the backbone terrestrial networks with a satellite link:

![Figure 1 - Overview of an on-board GSM system and connection to terrestrial networks](image)

The system typically consists of the airborne and ground segments: see figure 2.
2.9 This paper is concerned only with the airborne segment existing between the mobile handset and the airborne system comprised of the pico-cell and NCU. Arrangements for backhaul to the ground and the network arrangements on the ground are well established systems which raise no new issues of authorisation or technical compatibility. The satellite backhaul issues are further discussed in Section 6.15

Current rules on mobile phone use on planes

2.10 Until now, use of mobile phones (and other GSM and radio enabled equipment) on aircraft (see paragraphs 5.25 - 5.29 for legal obligations) has not been permitted in the UK due to safety concerns that transmissions from mobile handsets could interfere with aircraft and communications systems. Terrestrial mobile networks may also suffer interference from mobiles used on aircraft. In particular, terrestrial networks are planned on the assumption that mobiles are at ground level and cannot "see" many base stations at once.
Consumer demand

2.11 Research by operators and airlines suggests that there is consumer demand for such services, and there is now commercial interest in addressing the technical issues so as to enable a robust and reliable public mobile service on aircraft. However there may not be a high enough market demand to make such systems viable, and previous initiatives of this kind, for example the Terrestrial Flight Telephone System (TFTS: an on-board digital telephone service for aircraft passengers) have not been successful. There is some indication that other parties - such as cabin crew - may not take a positive view of the value of this service.

Technological developments

2.12 Changes and improvements in mobile technology and its associated infrastructure (base stations etc) and developments in aircraft manufacture and design have meant that proponents of these air borne systems believe there is now an opportunity to re-consider whether it would be permissible to allow the use of GSM systems on aircraft.

2.13 When a GSM enabled device is switched on it normally operates at its maximum power until it connects to a network and then begins to decrease. It is this initial surge of power which if unchecked and managed will be contained within the metal shell of the aircraft and its wiring and could possibly cause interference problems to aircraft systems.

2.14 Proponents of the on-board systems claim that developments in base station technology and aeronautical manufacturing and materials will now resolve this issue. The change which they claim is now possible in their proposed on-board systems is the reduction of the power of the mobile to the absolute minimum. This will be achieved by the on-board base station having the capability to limit the power transmitted by the mobiles to a minimum level and the on-board network control device (or other mitigation technique to shield the aircraft fuselage or a combination of the two) preventing the mobiles from “hearing” the ground networks.

2.15 Coupled to this is the proposal that the aircraft base station operates only in the GSM 1800 MHz band rather than the GSM 900 MHz band (as the minimum transmit power for GSM 1800 MHz terminals is lower than GSM 900 MHz) and at an altitude above 3000 metres, (as the path loss\(^1\) is higher for the GSM 1800 MHz band compared to GSM 900 MHz). These factors help reduce the levels of interference to networks on the ground from the proposed onboard mobile systems. The on-board network control device power must also be sufficient to remove visibility of the terrestrial networks, whilst not being so high as to cause harmful interference to them.

Q1 Should the provision of services using GSM at 1800MHz be allowed on aircraft if the terrestrial networks and avionic systems are not compromised? Given Ofcom’s statutory role, what other factors, if any, should inform a decision to allow the use of these services on aircraft?

---

1 In a communication system, path loss is the attenuation (decrease in intensity of a signal) undergone by an electromagnetic wave in transit between a transmitter and a receiver.
Section 3

International Approach

Multilateral or UK-only approach

3.1 The approach to authorising airborne GSM systems could be pursued by the UK on its own, independent of other countries; or it could be approached as a collaborative exercise by many countries working together. Benefits of a unilateral approach include the ability to tailor technical and regulatory solutions precisely to the UK environment. It may also lead to a quicker resolution of technical and regulatory issues and therefore allow operators to launch services earlier than otherwise. On the other hand, a multilateral approach may be preferable given that aircraft registered and licensed in the UK may have an effect on spectrum quality and usage when flying over foreign territory and vice versa.

3.2 A multilateral approach would allow all participants to benefit from a pool of expertise and thought; and systems when launched would be likely to have a much broader territorial domain in which they could operate. If there were any divergence between a UK-only approach and a subsequent multilateral agreement, then there would be a danger of UK aircraft having installations which were incompatible with the requirements of many other countries, and which would therefore have to be retrofitted to comply.

3.3 Ofcom up to now has preferred to adopt the multilateral approach, working with colleagues in CEPT countries to develop a common regulatory and technical approach, which will result in a common implementation even if this is achieved more slowly than under a unilateral approach. Readers of this paper are invited to comment on whether this is the preferable approach.

Q2 Is a multilateral rather than a unilateral approach to enabling these types of service appropriate?

European forums

3.4 Ofcom has responsibility for the management and licensing in the UK of the civil radio spectrum. The UK works closely with regulatory agencies and stakeholders in other countries, particularly in Europe. In pursuing a multilateral approach, Ofcom has in particular been working with the European Conference of Postal and Telecommunications Administrations (CEPT) and its Electronic Communications Committee (ECC) which is the top level body considering issues of spectrum standards and regulation.

3.5 The ECC is comprised of the following working groups:

- Working Group Frequency Management (WGFM);
- Working Group Radio Administration (WGRA);
- Working Group Spectrum Engineering (WGSE).

3.6 The ECC makes recommendations and reaches decisions on spectrum usage. The Decisions are not mandatory for member countries but, when implemented, form the basis for an approach to spectrum usage across the whole of Europe, not just the European Union. The ECC also works closely with the European Commission in
support of its role in implementing the various communications Directives and in supporting free circulation of radio equipment within the European Union.

3.7 The European Commission’s Radio Spectrum Committee is empowered to take decisions which are binding on member states. However, the issue of mobile services on aircraft issue has not been referred to the RSC, and Ofcom does not expect that it will address these issues in the short term.

3.8 The European Organisation for Civil Aviation Equipment (Eurocae) initiated a working group to study the electromagnetic compatibility between portable electronic devices and aircraft systems, publishing its initial findings in 2003. It has now begun a further study, co-ordinated with similar studies in the USA by the RTCA (see below para 3.24). It is planned that the results of the joint RTCA/Eurocae study will be completed by December 2006.

ECC activities

3.9 As a result of the commercial interest in this opportunity, Ofcom has been working in CEPT groups towards an ECC Decision to give a consistent regulatory and technical framework across Europe for the provision of GSM services on-board aircraft. Detailed work on this subject is being done by the CEPT in the working groups WGRA (regulatory aspects) and WGSE (spectrum engineering). An ECC Decision cannot be taken until both of these groups have concluded their work.

WGRA

3.10 WGRA is preparing a draft ECC Decision with the general aim of facilitating the free circulation and use of GSM Base station radio equipment and its component parts on board aircraft. It envisages that administrations should allow free circulation and use of such systems on the basis that operators of these systems are either authorised to use the required spectrum or have been exempted from the need to be so, in each case by the relevant authority in the country of registration of the aircraft.

3.11 Due to the nature of this type of system it will frequently be the case that on any one flight an aircraft will travel through the airspace of more than one country with the time spent in the airspace of any individual country being of short duration. The draft Decision therefore suggests that the country of registration of the aircraft should control the spectrum used by the GSM Base Transceiver Station on-board the aircraft and should apply its regulatory rules to the use of this spectrum. Such rules should be mutually accepted by other administrations, notably those into whose airspace the aircraft flies. The administration in which the aircraft is registered would therefore be responsible for authorising the GSM air-borne system and for resolving any interference caused to other radio systems at home and abroad.

3.12 The draft Decision document will also include an annex to address the essential technical and operational issues. The information for this annex will be taken from the technical compatibility report that WGSE will submit to the ECC. This technical compatibility report will provide the necessary parameters to protect terrestrial mobile

2 www.eurocae.org
networks. The draft annex questions and the draft Decision are available on the ERO server³.

**WGSE**

3.13 WGSE is preparing a technical compatibility study covering interference to systems outside the aircraft (especially ground-based GSM systems). This report considers the technical compatibility between GSM equipment (including any added equipment if needed) used on-board aircraft and terrestrial networks, including at least GSM900 MHz, GSM1800 MHz, and IMT-2000/UMTS. The study focuses on the compatibility of the system with terrestrial networks when the airborne system is working at more than 3000 metres above ground.

3.14 The WGSE study only deals with use of the GSM 1800 MHz band on board aircraft, although the use of the GSM 900 (and other frequency bands) could be envisaged in future studies. The study does not cover the impact of terrestrial networks on the GSM on-board aircraft system, nor does it consider regulatory and operational aspects or compatibility with the aircraft systems. Details summarising the current analysis of the WGSE PT SE7 Report can be found in Annex 1.

**Ofcom involvement in the ECC process**

3.15 Ofcom has a statutory obligation to represent the UK in the Conference of European Postal and Telecommunication administrations (CEPT) (with some exceptions) and the spectrum committees of the European Union (EU). Ofcom is also involved in several other EU international organisations (e.g. the European Telecommunication Standardisation Institute (ETSI)), in pursuit of our objectives and the interests of Government and our stakeholders.

3.16 Ofcom supports the introduction of new services that provide benefits to citizen-consumers and this has been the guiding principle for its engagement with CEPT on this subject.

3.17 Ofcom has been represented at WGRA and WGSE during the process so far. It has supported the main direction of both the regulatory and technical work. It is paying careful attention to the developments within CEPT on this application in terms of the draft ECC decision and the accompanying technical compatibility report and it plans to remain actively engaged in the CEPT process.

3.18 Before Ofcom can take a decision as to whether and how to proceed in its decision making process for mobile services on aircraft, it needs to take steps to ensure that any planned introduction and implementation of GSM use on aircraft is both technically and legally robust and defensible. As noted previously in paragraph 3.1 given the international nature of both communications and air transport, it seems clear that any approach taken by Ofcom should be workable at least in the broader European context. The success of any such system may well be dependent on mutual recognition and cooperation between administrations. Ofcom’s approach to this issue has therefore been to work towards a common European position.

Timetable for ECC Decision within CEPT

3.19 The work of the sub groups, particularly WGSE, is still some way from conclusion. The earliest timetable for the ECC’s accepting a draft Decision, and the subsequent consultative procedure is as follows:

- The ECC met on 20 – 24 March 2006 to review the ongoing work on the WGRA Draft ECC Decision and WGSE Technical Compatibility Report. The meeting concluded the draft ECC Decision was ready for public consultation, but should be delayed until the Technical Compatibility Report has been completed by WGSE and it can be confirmed there are no numbering issues. The ECC decided to postpone the adoption of the ECC Decision until the July meeting of the ECC;

- As yet to be agreed a further meeting within WGRA\(^4\) will be convened in April or May to collate the work of the draft ECC Decision and Technical Compatibility Report together and conclude on the ECC Draft Decision and Annex.

- WGSE meet on 8 – 12 May 2006 to conclude on the Technical Compatibility Report work;

- ECC meet on 3 – 7 July 2006 to review the position of the Decision and Technical Compatibility Report for consultation or just review the Technical Compatibility Report for consultation, depending on the outcome of the previous meetings;

- Administrations are given two weeks from the date of the ECC approving the draft Decision for public consultation(s) to raise concerns.

- Conclusion of consultation will most likely be three months (12 weeks) from the closure of the Administrations’ two week notice period.

- Depending on the results of the consultation publication of the ECC Decision will be six weeks after the consultative process closes.

The ECC Consultative Process and its indicative timescales are covered by Article 12 – Mechanism for Decisions of the ECC Rules of Procedure. These can be found at [www.ero.dk](http://www.ero.dk) under ECC Activities / ECC / ECC Rules of Procedure.

Developments in other jurisdictions

3.20 Other Regulatory bodies such as the U.S. Federal Communications Commission (FCC) and the Asia Pacific Telecommunity (APT) are also looking into this issue at present.

**USA**

3.21 The Federal Communications Commission (FCC)\(^5\) is currently considering proceedings (No.9 WT04-435)\(^6\) that will let airline passengers use their phones throughout domestic flights\(^7\). The FCC is looking at minimising barriers for the use of three different frequency ranges for airline passenger communications. These are the

---

\(^4\) WGRA and its individual sub-groups are in the process of being re-organised to provide an improved focus on regulatory issues to ECC member states. The work of GSM on aircraft currently undertaken by RA6 may either be moved into a specific ECC project team to finish off this work or it may remain with WGRA in a new sub group after the re-organisation in March / April 06.


\(^6\) [http://wireless.fcc.gov/spectrum/proceeding.htm](http://wireless.fcc.gov/spectrum/proceeding.htm)

849 MHz to 851 MHz and 894 MHz to 896 MHz range and the frequencies at 1800/1900 MHz.

3.22 To enable the use of mobile phones on aircraft in the US, the FCC issued a Notice of Proposed Rulemaking (NPRM) in 2005 regarding the removal of its rule (Section 22.925 of the Commission's rules, 47 CFR Part 22) that prohibits airborne use of mobile phones. The NPRM generated numerous comments that will be considered, but there is currently no published timescale identifying when the FCC will complete this task. The FCC rule exists to protect against a mobile phone interfering with cellular networks on the ground, but the FCC now feel that as cellular network design has changed significantly since that prohibition was adopted in 1991, it may be possible to authorise direct communications from airborne mobile phones to cell sites on the ground and internally on the aircraft without causing interference. The further issue of interference from mobile phones to on-board air navigation systems is being considered by the Federal Aviation Authority (FAA) in a parallel investigation.

3.23 Data-centric systems, using WiFi and frequency bands where licence-exempt equipment is authorised, are likely to be approved for use in aircraft by the FAA and FCC. In Europe, the UK and some other European states have authorised the use of WiFi equipment in aircraft, as has Japan. The fact that the 2.4 GHz band is available to licence-exempt devices operating at low power makes it easier for authorities to agree to its use on aircraft, as there is little danger of harmful interference to terrestrial systems.

3.24 The FCC issued a notice of proposed rule making that would effectively remove the prohibition on the use of 800 MHz cellular phones and wireless communications devices on aircraft equipped with new types of technology, including picocell networks and wireless Internet or “WiFi” networks. The FCC had hoped to issue a final ruling in 2006. However, the FCC has no published timescale for the review of the comments received during the NPRM’s consultation.

3.25 The Federal Aviation Authority (FAA) in the USA has asked RTCA Inc to conduct a study into whether wireless PEDs such as mobile phones, PDAs, and laptops can be proven to used in a manner where interfere with aircraft systems is avoided. This study is in two phases. The first phase was recently completed with the publication of an up date to DO-294, Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft. The update to this document is DO-294A. Phase two is a longer-term PED technology assessment and the committee will focus on emerging PED technologies, for example picocells for telephone use on board aircraft. It is planned that the RTCA study will be completed in December 2006.

3.26 The RTCA committee conducting the study is known as Special Committee 202 (SC-202). This committee includes representatives from consumer electronic device manufacturers, avionics manufacturers, aircraft manufacturers, airlines, aircraft operators, pilot and flight attendant associations including AFA-CWA, regulatory agencies, and related industry associations. The next meeting of SC-202 is in April 2006.

8 http://wireless.fcc.gov/services/index.htm?job=operations_1&id=cellular
9 http://www.rtca.org
10 http://www.rtca.org/comm/Committee.cfm?id=1
11 http://ashsd.afacwa.org/index.cfm?zone=unionactive/view_article.cfm&HomeId=17917
Asia-Pacific Telecommunity (APT)

3.27 In the Asia-Pacific region, the Asia-Pacific Telecommunity (APT)\(^{12}\) has developed a proposed framework for the use of mobiles on-board aircraft, which was submitted to the second meeting of the Wireless Forum\(^{13}\) in September 2005 (in the form of an AWF (APT Wireless Forum)\(^{14}\) Opinion)). This document is very similar in scope and content to the ECC Draft Decision and as a result of the second meeting of the Wireless Forum meeting, the document is effectively in final form and is to be circulated to member administrations for input from civil aviation authorities. The intention is to finalise the document at the next AWF meeting (after which it would be specifically available for use in discussions between service providers and administrations when the introduction of services is envisaged in their countries).

3.28 The APT administrations have agreed to review the results of the ECC WG SE Compatibility Report once provided to them, and will continue to consider the technical, regulatory and licensing issues in the draft Framework concurrently.

3.29 The proposed framework for the use of mobile phones on-board aircraft was further reviewed at the APT Wireless Forum Interim Meeting\(^{15}\) on 4 – 5 March 2006: [http://www.aptsec.org/meetings/2005/apg07-2/AWFInterim%20Meeting%20Documents/(37Rev.2)FrameworkSITA.doc](http://www.aptsec.org/meetings/2005/apg07-2/AWFInterim%20Meeting%20Documents/(37Rev.2)FrameworkSITA.doc). This document is the latest version available. The AWF will further consider the proposed framework for the use of mobile phones on-board Aircraft with a view to approving an AWF Opinion at its next AWF meeting. The date for the next AWF meeting is yet to be set.

3.30 Other global regions are watching developments in the USA, APT and Europe with interest, but have not yet taken steps to permit the use of any GSM systems on aircraft.

Other Government / Agency concerns

3.31 There may also be other spectrum–related concerns from other UK Government and security agencies that will need to be addressed before the use of GSM can be deployed on aircraft. Terrestrial systems in the GSM bands are normally cleared through the Site Clearance process. Systems on-board aircraft may raise specific clearance issues and UK Government spectrum users may need to be separately assured that no harmful interference will be created.

\(^{12}\) [http://www.aptsec.org/](http://www.aptsec.org/)

\(^{13}\) [http://www.aptsec.org/Program/APG/AWF/pawf.html](http://www.aptsec.org/Program/APG/AWF/pawf.html)

\(^{14}\) The documents (including the framework document) for second meeting of the APT Wireless Forum meeting can be found at: [http://www.aptsec.org/Program/APG/AWF/pawf.html#documents](http://www.aptsec.org/Program/APG/AWF/pawf.html#documents). The relevant Documents are AWF-2/01 (section 4.1.4), AWF-2/51, AWF-2/52 and AWF-2/62(Rev1) (The AWF framework).

\(^{15}\) The documents (including the revised framework document) for the APT Wireless Forum Interim meeting can be found at: [http://www.aptsec.org/meetings/2005/apg07-2/AWF-InterimMeeting2005Documents.htm](http://www.aptsec.org/meetings/2005/apg07-2/AWF-InterimMeeting2005Documents.htm). The relevant Documents are AWF-IM1/01(Rev2) (Section 4.1.3), AWF-IM1/8 and AWF-IM1/37(Rev2) (The revised AWF framework).
Section 4

Mobile services on aircraft and wireless telegraphy licensing

4.1 This section sets out the principal issues associated with the regulatory requirements under the Wireless Telegraphy Act 1949 which are emerging as a result of the discussions in European forums and with stakeholders. These will require resolving before mobile services on aircraft could be permitted in the UK.

Wireless Telegraphy Act jurisdiction

4.2 Rights over territorial airspace are governed by the International Civil Aviation Convention (ICAO) (the “Chicago Convention”), Article 1 of which provides for State sovereignty over territorial airspace. This forms the basis for the UK’s right to permit and/or prohibit certain activities, such as use of wireless telegraphy apparatus, in UK territorial airspace. Also Article 17 of the Chicago Convention provides that aircraft have the nationality of the State in which they are registered. Furthermore, by virtue of Article 18 of the Convention, an aircraft cannot have more than one valid State registration at any given time. This position is incorporated into UK law by way of the Air Navigation Order 2005 (S.I. 2005/1970) (the “ANO”),

4.3 Various international conventions (Chicago, Tokyo, Hague, Montreal) recognise the sovereignty of the State of registration in terms of jurisdiction over an aircraft itself and the cabin space therein. The various international rules governing jurisdiction over aircraft give rise to the general principle whereby the cabin space of an aircraft is regarded as part of the territory of the State in which the aircraft is registered. This means that, in the case of a UK-registered aircraft, for example, it does not matter that the aircraft is flying in the airspace of another State as the international aviation conventions provide that the aircraft will still be subject to the jurisdiction of the UK, save for exceptional circumstances.

4.4 Section 1 of the Wireless Telegraphy Act 1949 (WTA) requires that a licence be obtained prior to establishing, using or installing wireless telegraphy stations or apparatus. A person who undertakes such activities without a licence commits an offence under section 1, except where these activities are exempt from licensing (see paragraph 4.12). In accordance with the general principle, section 6 provides that a licence must be obtained in respect of UK registered aircraft, including those which operate outside UK territory.

4.5 To be lawful therefore, the installation and use of wireless telegraphy apparatus (effected by virtue of the transmission from the airborne system to a mobile handset between points 1 and 2 in figure 1 on page 6) on UK registered aircraft for use both within and outside the UK must be licensed.

4.6 Establishment, installation and use of wireless telegraphy apparatus in or over the UK or its adjacent territorial waters (even temporarily) also requires to be licensed (or licence exempt) under sections 1 and 6 of the Wireless Telegraphy Act 1949. This effectively means that a foreign-registered aircraft which intends to use wireless telegraphy apparatus in or over the UK should obtain a WT Act licence. However, it is common practice that aircraft operator wireless telegraphy licences issued in one jurisdiction for systems related to the navigation of the aircraft are recognised by other jurisdictions. Instead “visiting” aircraft are bound only by the provisions of the

4.7 The rights and duties of Ofcom to license use of the spectrum within a UK-registered aircraft established by the aforementioned laws and conventions are likely to be mirrored by those of other administrations. The proposals for a common regulatory approach being made by WGRA therefore envisage each administration recognising the authority of all other signatory administrations to regulate wireless telegraphy on board aircraft of their registration as they see fit.

4.8 The exception to this is of course the need to avoid any interference from aircraft into other systems and networks which fall under the jurisdiction of other administrations, such as terrestrial systems. Harmful interference to these other systems and networks would not be acceptable to any administration.

Authorisation by licence under the Wireless Telegraphy Act

4.9 As mentioned above, section 1 of the Wireless Telegraphy Act 1949 requires that a licence be obtained prior to establishing, using or installing wireless telegraphy stations or apparatus. Section 6 provides that a licence must be obtained in respect of UK registered aircraft, including those which operate outside the UK. Section 6 also permits Ofcom to license all stations and apparatus in or over the UK and/or its territorial waters.

4.10 Wireless telegraphy licences are granted to aircraft operators and they detail the frequency ranges of the radio equipment on-board the aircraft, (such as those used for navigation etc), and the relevant legal instruments with which the licensee is obliged to comply. New radio equipment is generally added to the aircraft licence by a "Notice of Variation". Wireless telegraphy licences for aircraft are issued by the CAA on behalf of Ofcom. Section 6 of the Wireless Telegraphy Act provides that the captain of an aircraft is himself guilty of an offence where certain wireless telegraphy offences are committed on board. It is therefore logical that the aircraft operator (who employs the captain) is licensed under the current system.

4.11 Providing that a licence lists the equipment carried, this may be deemed sufficient for international regulatory compliance. It may be possible to achieve this with a licence for the GSM aircraft base station issued separately from the aircraft radio licence, but which would necessarily be endorsed with other licensing particulars such as aircraft registration/call sign etc. Alternatively, it may be possible to achieve the same objective by issuing a Notice of Variation to the (existing) aircraft radio licence. This Notice of Variation would include details of the aircraft mobile base station in addition to other licensing details. Finally, there might be a case for exemption from the need for individual licensing where Ofcom was satisfied that use of the equipment was not likely to involve any undue interference with wireless telegraphy.

Licence exemption/general authorisation

4.12 Article 5(1) of the EU communications Authorisation Directive (2002/20/EC) states that Member States shall, where possible, in particular where the risk of harmful interference is negligible, not make the use of radio frequencies subject to the grant of individual rights of use but shall include the conditions for usage of such radio frequencies in the general authorisation.
4.13 Section 1AA of WT Act similarly requires that use of equipment be subject to general authorisation by being made exempt from the requirement to hold a licence where Ofcom is satisfied that there is unlikely to be harmful interference to wireless telegraphy. This is done by Ofcom making a statutory instrument which permits licence exemption.

4.14 The legal obligation imposed by Article 5(1) of the Authorisation Directive extends to all Member States, so if it were found that the GSM on aircraft application was subject to this requirement, then it would apply to all Member States. Part of the work of CEPT WGRA has been to consider the potential for licence-exemption: the draft Decision prepared by this group indicates that there may be differences between Member States in deciding whether to permit general authorisation this application or not. Licence exemption has the advantage for administrations of being the simplest to administer and to operators of being the one with the least onerous regulatory requirements. It benefits new entrants to the market by removing any additional regulatory barriers to entry; and may encourage innovation and experiment among those implementing systems.

4.15 At this stage, a challenge in determining whether licence exemption is a feasible option lies in the fact that the actual level of interference, if any, has yet to be gauged.

Licences for operation of mobile services on aircraft.

4.16 If licence exemption is not possible Ofcom would need to establish a transparent licensing regime to ensure that all aircraft systems had an appropriate licence; with any special conditions needed for aircraft use.

Who should hold a licence

4.17 Should it be decided that a licence is necessary for this application then the question arises of who should hold the licence. Clarity about this is essential to ensure interference issues can be resolved swiftly. The relevant persons appear to be:

1. the captain of the aircraft;
2. the aircraft owner or operator; or
3. a third party operator or installer of the equipment

Each of these possibilities is discussed further below.

4.18 In accordance with the provisions of section 1(1) of the WT Act the person under the obligation to hold the licence would be the person installing and/or using the transmitter. There may well be a good case for applying the same principles to the award of that licence as those which apply to the award of other wireless telegraphy licences for aircraft, for example those which permit use of air navigation equipment.

4.19 **The Captain of the aircraft.** Under the WT Act and the international conventions to which the UK is a signatory the person responsible for the safe and legal operation of all equipment on-board an aircraft is the captain. It might be possible to make the captain the licensee for mobile purposes. As mentioned above, Section 6 of the Wireless Telegraphy Act provides that the captain of an aircraft is guilty of an offence without prejudice to the liability of any other person, in the event that there is a breach of section 1 of the Act. However while individual captains will always need to supervise the safe operation of the equipment on each flight, their ability to ensure that it generates no harmful interference is likely to be limited.
4.20 **The aircraft owner or operator.** The primary concern which would encourage the issue of specific licences for aircraft use is the avoidance of interference. As the source of any potential interference is the individual aircraft then it would be convenient for the licence to be associated with it.

4.21 Aircraft have many other certificates and authorisations – for safety, airworthiness and hold wireless telegraphy licences for the many other radiocommunications systems which they require. All these certificates and authorisations are acquired and maintained current by the aircraft owner; and are passed on to new owners when the aircraft is sold. In issuing a new category of licences it would be convenient for aircraft owners and for regulators to continue this approach and license the owners or operators of individual aircraft. Further, as mentioned above, Section 6 of the Wireless Telegraphy Act provides that the captain of an aircraft is guilty of an offence without prejudice to the liability of any other person in the event that there is a breach of section 1 of the Act. Granting licences to the aircraft operator (which employs the captain) therefore appears to have merit.

4.22 **A third party operator or installer of the equipment.** Ofcom could grant the licence to third parties who install and/or operate the system on-board. This approach would guarantee that the licensed party was technically expert and could be held responsible for any breach of the limits of interference which occurred. However it is not clear how a choice could be made about which companies were granted licences of this kind. In practice, a GSM system could only be installed on-board an aircraft at the active request of the aircraft owner; and it could only be used commercially if the airline operator took the initiative in making it available for passengers to use. In such circumstances it could create an unnecessarily complicated regulatory structure if the aircraft operator could only deal with a limited number of licensed providers to supply the service and equipment. Further under that approach, the persons actually using and in control of the equipment (the aircraft operator and the captain) would not be licensed.

Q3  **Should the equipment for mobile services on aircraft be licence-exempt?**

Q4  **If licensing for use of the equipment on board aircraft is required, who should hold the licence?**
Section 5

Legal issues

Legal status of Network Control Unit (NCU)

5.1 The system being explored by WGSE requires reception of terrestrial GSM signals on-board the aircraft to be blocked, in order to ensure that handsets use the minimum power necessary to reach the on-board base station; and to avoid any communication with base stations on the ground. To ensure that all terrestrial signals are blocked a Network Control Unit (NCU) has been specified which emits a broadband signal to mask all the mobile bands. The NCU would effectively prevent all direct communications between handsets on the aircraft and base stations on the ground.

5.2 Masking or blocking of signals can also be described as ‘jamming’. There is no prohibition in UK law on the use of a jamming device as such. However, section 13 of the WT Act makes it a criminal offence for a person to use apparatus for the purpose of interfering with wireless telegraphy. This is known as deliberate interference. The functioning of the NCU means it could arguably be seen as a device designed to interfere with wireless telegraphy from the terrestrial systems.

5.3 A contrary view is that the NCU is a control component of the GSM pico cell on-board the aircraft, the purpose of which is to prevent the mobile phones on an aircraft “interfering” with terrestrial base stations. On this basis it may be argued that the NCU is therefore not a jammer as in fact it permits transmissions to take place rather than prevents them.

R&TTE Directive

5.4 Under the Radio and Telecommunications Terminal Equipment Directive (RTTE) R&TTE Directive 1999/5/EC certain specified equipment can only be placed on the market in the EEA (by manufacturers, suppliers and importers) if it complies with prescribed specifications. These specifications or ‘essential requirements’ include that the radio equipment shall be constructed so as to avoid harmful interference. All of the essential requirements are set out in Annex 2.

5.5 This means that before the on-board pico cell and NCU equipment can be released onto the market it must comply with the requirements of the R&TTE Directive. If it does not (for example, because it has been constructed in a manner which creates harmful interference) then it cannot be certified for release.

5.6 The R&TTE Directive 1999/5/EC has been implemented into UK law by the Radio Equipment and Telecommunications Terminal Equipment Regulations 2000 (SI 2000/730).

EMC Directive

5.7 All radio equipment, including jammers, is also subject to the Electromagnetic Compatibility Directive (EMC) Directive EC89/336 which has been implemented into UK law by the Electromagnetic Compatibility Regulations 1992 (SI 1992/2372) as amended. These regulations specify that all electrical and electronic apparatus placed on the market or taken into service in the UK, including imports, satisfy specific requirements to ensure that they do not cause excessive electromagnetic
interference or are adversely affected by it and have to carry the CE mark to show compliance. The European Commission supports Members States’ views that since jammers by their nature cause significant electromagnetic interference it is likely that most do not comply with the UK regulations and therefore they cannot be legally placed on the UK market.

5.8 It will be up to the manufacturers of the on-board system equipment to ensure that all their equipment complies with all the relevant requirements of both the R&TTE and EMC Directives.

Telecommunications authorisation requirements

5.9 Operators of mobile systems on aircraft are likely to be providing an electronic communications service and as such will fall within the scope of the Authorisation Directive (2002/20/EC). The principle behind the Authorisation Directive is that general authorisations (as opposed to specific operating licences) should be made available.

5.10 In the UK general authorisations are effected by the General Conditions of Entitlement which are made by Ofcom under the Communications Act 2003. Operators of an electronic communications system may also be subject to specific conditions dealing with the provision of universal service, access to particular services (such as directories and emergency numbers) and significant market power.

5.11 A list of the General Conditions is contained at Annex 3. Note that different conditions apply to different types of operator, depending on the service they are providing. Depending on how these services are classified will ultimately determine those conditions and requirements of the general conditions of entitlement with which they will need to comply.

Q5 What considerations (practical or otherwise) are relevant to compliance by the operators of on-board GSM systems with the General Conditions of Entitlement?

Interference protection

5.12 Ofcom is responsible for ensuring that spectrum users do not cause harmful interference to others. The legal framework under which this responsibility is exercised is the Wireless Telegraphy Act and the licensing and interference management regime which Ofcom operates under it. This extends to sixty miles above the Earth, the altitude from which the Outer Space Act 1986 applies, and 12 nautical miles off the coast in territorial waters. As set out above, UK-registered aircraft can be assumed to be UK territory for spectrum management purposes, wherever they are in the world.

5.13 Furthermore the legal status of the territorial sea is set up to a limit not exceeding 12 nautical miles as detailed in UNCLOS Article 2, 3 and 4.

5.14 UK licensees and operators of terrestrial systems will also expect that their services will not suffer undue interference. It is therefore essential that aircraft operating within UK airspace, whether registered in the UK or overseas, must create no harmful interference which affects ground based systems. This issue is discussed further in Section 6.

5.15 It should also be noted that the fundamental global requirement for a licence stems from Article 18.1 of the ITU Radio Regulations (see Annex 4).
5.16 Ofcom aims to ensure that airborne systems create no harmful interference to ground systems. This is consistent with the Visiting Ships and Aircraft Regulations (1998) (VSAR 98) which requires that “apparatus for wireless telegraphy on-board a visiting ship or visiting aircraft shall be used so as not to interfere with the emitting and receiving of any wireless telegraphy”.

**Competition**

5.17 Research conducted last year by one of the proponents for mobile services on aircraft, showed that nearly half of all international business fliers would prefer to travel on airlines that allow the use of mobile phones in flight and nearly one-third of those surveyed were willing to pay between two and a half and five euros per minute for in-flight mobile phone services.

5.18 There are various business models that are being considered by airlines as they seek to balance the desire for revenue generation with service provision. One model proposed by the proponents of these systems is that the system will address the airspace in the aircraft cabin as a virtual GSM country, simplifying mobile addressing and connectivity during the flight.

5.19 Ofcom understands that billing would be through the subscriber’s terrestrial GSM service provider using roaming agreements negotiated by the relevant parties. Revenue would be shared between the GSM on-board provider, the backhaul provider, the airline and the customer’s home MNO. It would be for the parties to agree the appropriate revenue split.

5.20 The business models proposed by various consortia assume a partnership between aircraft operators, system operators, mobile network operators and other parties. Such arrangements would need to comply with competition rules and legislation. Ofcom has not, at this stage, given detailed consideration to this issue, but to the extent that it has given consideration, it has not identified any concerns in relation to competition in the provision of these services. Readers of this paper are invited to comment if they foresee any concerns in relation to competition.

**Q6** Do you have any comments in relation to competition in the provision of these services?

**Numbering**

5.21 Ofcom is responsible for preparing and administering the overall UK numbering plan, comprising numbers, number series and addresses to be used in connection with the provision of electronic communications networks or services. This element of any telecommunications network is essential to enable the roaming of mobile terminals from one network to another. Ofcom is currently consulting on the wider framework for future numbering strategy.\(^\text{16}\)

5.22 The systems proposed for use on board aircraft envisage customers roaming onto the service offered on-board, a process similar to their registering with an operator when visiting a foreign country. Under these circumstances the customers and people calling them will see no change to their normal handset number; but the on-board operator will need to have a mobile network code (MNC) number to allow for registration and call direction to take place.

\(^{16}\) "Telephone Numbering - Safeguarding the future of numbers" : [http://www.ofcom.org.uk/consult/condocs/numberingreview/](http://www.ofcom.org.uk/consult/condocs/numberingreview/)
5.23 Ofcom appreciates that the use of GSM networks on aircraft will require the use of Mobile Network Codes (MNC) and possibly other mobile numbering. However, we believe that what is a correct allocation of MNC and numbering depends very much on the nature of the aircraft service pattern. For instance, a purely domestic aircraft service would appear to qualify for UK numbering resources, whereas a routinely international service would appear to qualify for international numbering resources.

5.24 Mobile Network Codes are finite for each national administration so it clearly makes more sense that if a network is routinely outside of UK territory (i.e. outside Ofcom control) either an international numbering resource, or the resource of another more routinely accessed country, is most appropriate to enable these systems to operate. Ofcom notes that there is already an ITU number range for international mobile networks (901) although, subject to international discussion, it may be that another range could be set aside specifically for on-board aircraft networks. Alternatively, the MNC of an existing terrestrial operator could be used.

Q7 Should international mobile network codes be allocated to these on-board mobile systems or national codes?

Legislation regarding the safety of using a mobile phone on an aircraft

5.25 Article 19(8) of the Air Navigation Order 2005 (S.I. 2005/1970) requires that “all equipment installed or carried in an aircraft, whether or not in compliance with this article, shall be so installed or stowed and so maintained and adjusted as not to be a source of danger in itself or to impair the airworthiness of the aircraft or the proper functioning of any equipment or services necessary for the safety of the aircraft”. The captain and operator have responsibility for safety.

5.26 The use of mobile phones and other electronic devices on aircraft is governed through that provision (see Aeronautical Information Circular (AIC) 1/2004 (pink62)17). This provides the relevant information regarding the legislation that prohibits the use of mobile phones (classified as intentionally transmitting PED’s (see section 2.5)) on aircraft.

5.27 The Joint Aviation Authorities (JAA) JAR OPS18 1.110 (Joint Aviation Requirements – Operations) also specifies “an operator should take all reasonable measures to ensure that no person does use, on board an aeroplane, a portable electronic device that can adversely affect the performance of the aeroplane’s systems and equipment”. The Joint Aviation Authorities (JAA) is an associated body of the European Civil Aviation Conference (ECAC) representing the civil aviation regulatory authorities of a number of European States who have agreed to co-operate in developing and implementing common safety regulatory standards and procedures. JAR-OPS sets out safety standards soon to be adopted under an amendment to EU Commission Regulation 1592/2002 which will place impose binding legal requirements. The Air Navigation Order remains the UK’s legal operational code until such time as 1592/2002 is amended to supersede this.

5.28 The AIC quoted above provides information about complying with the Air Navigation Order and JAR-OPS detailing appropriate procedures to be implemented in relation to intentionally transmitting PED’s.

17 http://www.ais.org.uk: This site is run by the National Air Traffic Service (NATS) and requires users to subscribe to their web site to obtain the information.
18 http://www.jaa.nl/operations/public_area.html
5.29 In relation to the legality of mobile phone use on aircraft under the wireless telegraphy regime, such use has not been licensed by Ofcom nor made licence exempt. At present therefore any mobile phone or device connecting to an on-board mobile system would be illegal as it would not be covered by the conditions set out in the Wireless Telegraphy (Licence Exemption) Regulations 2003 (S.I. 2003/74)\textsuperscript{19}.

\textsuperscript{19} \url{http://www.opsi.gov.uk/stat.htm}
Section 6

Technical issues

Interference protection

6.1 Ofcom is responsible for ensuring that spectrum users do not cause harmful interference to others and aims to ensure that airborne systems create no harmful interference to ground systems. UK licensees and operators of terrestrial systems will expect that their services will not suffer undue interference and it is therefore essential that aircraft operating within UK airspace, whether UK or overseas registered must create no undue interference which affects ground based systems. The legal framework under which Ofcom carry out this responsibility is discussed in sections 5.12 - 5.16.

Potential interference to terrestrial systems

6.2 Mobile handsets and devices switched on during flight have the potential to interfere with numerous terrestrial base stations as they try to register with the closest base stations at any given time. Given that substantial geographic distances are covered by aircraft in a relatively short period of time, this means that a mobile handset could attempt to register with many terrestrial base stations. This could increase co-channel interference beyond that assumed by the network planners and thereby degrade the quality of service on the ground. Mobile handsets are normally only a metre or two above ground height and terrestrial clutter will ensure that only a small number of base stations will be in the served area of a mobile at any one time: mobiles in an aircraft, on the other hand, can ‘see’ numerous base stations at any time.

6.3 Studies are being conducted in CEPT WGSE to determine whether airborne systems will be compatible with (that is, will not cause degradation of) terrestrial networks. The working assumption for the moment is that systems can be specified which create no harmful interference to terrestrial networks so long as the aircraft is above an altitude of 3000 metres. Modelling based on airframe attenuation measurements is being progressed and results examined to check that this immunity from interference is achievable.

6.4 It has been suggested that a limit of 6000 metres might give a higher margin of certainty that no interference to terrestrial systems could happen. However, this could limit the utility of the service on short-haul flights. Alternative limits could be considered for higher and lower minimum altitudes although the practicality of this would require detailed review, to ensure that the different modes of operation, possibly on different aircraft installations were assessed and operated appropriately.

6.5 It is essential that the technical assumptions claimed for proposed operational GSM on aircraft systems hold true and the final technical analysis supports the preliminary conclusions, in order that operators of terrestrial systems should not suffer harmful interference.

Potential Interference to airborne aircraft systems

6.6 Aircraft operate in a potentially hazardous environment and many of their systems are safety devices intended to reduce the risks of operating in that environment. At present the use of mobile telephones and devices on-board aircraft is forbidden as
they could present a possible source of electro-magnetic radiation which may interfere and adversely affect the aircraft’s systems.

6.7 Airworthiness certification for the proposed systems will require demonstration that the GSM base stations and handsets have no adverse effect on aircraft systems. Responsibility for ensuring that no adverse effects are possible does not rest with Ofcom. This is an aspect outside Ofcom’s competence and consideration of these issues is being done by the European Aviation Safety Agency (EASA), International Civil Aviation Organisation (ICAO) and the International Air Transport Association (IATA) in parallel work streams. UK expertise to these groups is provided by the CAA.

6.8 It should be noted that once a base station transmission is sensed GSM handsets and devices initially seek a transmission slot through short, full-power bursts of transmission. Once a slot is negotiated, power is stepped down if possible. Therefore even with an on-board base station, one or more phones could be transmitting at full power at times – the worst case scenario is likely to be immediately after an announcement of the system being enabled. It is likely that passengers will not differentiate between products once they become aware of the availability of the service. Therefore it is important to ensure that the system will be safe and all possible risks appropriately mitigated.

6.9 To this end whilst the idea of mobile services on-board aircraft may be desirable all reasonable measures must be taken on board aircraft to ensure that no portable electronic device (PED) (this includes mobile telephony) can adversely affect the performance of the aircraft or its systems.

6.10 The issues the appropriate aviation regulatory authority or agency will primarily be concerned with are safety of life issues and interference to aircraft systems from both the use of mobile phones and the GSM base station infrastructure onboard the aircraft. These issues will be addressed through the airworthiness certification process, currently administered in the UK by the CAA on behalf of the EASA. It is essential that these issues are fully resolved before the provision of a GSM system could be allowed on any aircraft, especially one that is UK registered. Without these issues being fully resolved and airworthiness certification being granted it will not be possible to deploy GSM systems on aircraft.

**Behavioural and human factors issues**

6.11 The potential for increased levels of agitation from passengers is a factor to be noted. In the UK the CAA also has responsibility for considering the human factors arising from the use of mobile phones on-board.

6.12 The human and behavioural issues associated with allowing mobile services on aircraft which may also create safety concerns are also outside Ofcom’s jurisdiction and will be dealt with by the same aeronautical bodies mentioned in 3.34. No systems would be allowed to operate on UK registered aircraft without the approval of the relevant authorities and with the appropriate inter-administration agreements to ensure that authorisations were mutually recognised by participating countries.

6.13 Aircraft operators will need to decide on procedures for permitted use and on how the service should be offered, e.g. business class only, quiet zones, system down time (for when passengers might wish to sleep) etc.
Mobile Services on Aircraft

6.14 Further information concerning the EASA’s and the CAA’s responsibilities may be found on the EASA’s and the CAA’s websites: [www.easa.eu.int](http://www.easa.eu.int) and [www.caa.co.uk](http://www.caa.co.uk).

**Backhaul issues**

6.15 To enable the GSM system on the aircraft to connect to the terrestrial network a backhaul link – most likely provided by satellite - will be required. This link is completely separate from the GSM system on the aircraft. The CEPT work is focused on the regulatory and technical issues around in-cabin GSM working and does not cover the backhaul requirement. A CEPT Decision has been created (ECC/DEC/(05)11)\(^{20}\) for satellite-based aircraft communications systems. Ofcom is currently reviewing whether the UK should implement this Decision. Ofcom currently issues a standard licence for the network operation of satellite aircraft earth stations (14.0 to 14.25GHz uplink only). These are limited to operation above 7000ft or when the aircraft is stationary on the ground and at a site cleared location. Systems licensed in this way can provide the backhaul needed by the proposed GSM systems.

**How the airborne GSM system could be controlled**

6.16 It has been advocated by proponents of airborne GSM systems that an aircraft operator can manage the proposed system on an aircraft just as they would handle all other radio equipment on-board and that the aircraft crew can handle the on-board GSM aircraft system, with a minimum of extra workload and training, to allow passengers to place and receive calls when at cruising altitude.

6.17 The system will only be operated during the non-critical phase of the flight, i.e. during the cruise phase, and will not be operated while the aircraft is on the ground or during take-off, initial climb, approach or landing. Current assumptions in the CEPT working groups are that the system must be controlled to ensure that mobile handsets on the aircraft do not try to connect to a terrestrial network; and that the system is only operated above 3000m (10,000 ft). The use of the mobile terminals and the system would be subject to the control of the Captain of the aircraft and would have to be switched off at all times when requested to do so by the Captain.

**Technologies covered**

6.18 At present the draft ECC Decision only addresses GSM systems in the 1800 MHz band, but it also contains a review period to enable it to be amended, particularly if the market develops so that other types of mobile technology become ubiquitous.

6.19 The ECC Decision is expected to mark the beginning of a new and expanding market for mobile services. Given the safety critical considerations necessary to allow “uncontrolled” public radio use on an aircraft, the ECC has taken a cautious approach in focusing attention on one specific application. By considering a very narrow set of technical characteristics (i.e. GSM) within only one of the frequency bands used for mobile communications (1800 MHz) the complexity of the compatibility studies with avionic systems will be much simplified.

6.20 Should this application prove to be a success, it will open the way for other systems to be evaluated. This Decision may therefore end up as one of a suite of Decisions or

\(^{20}\) ECC Decision of 24 June 2005 on the free circulation and use of Aircraft Earth Stations (AES) in the frequency bands 14-14.5 GHz (Earth-to-space), 10.7-11.7GHz (space-to-Earth) and 12.5-12.75 GHz (space-to-Earth)
may be amended to become more generic and technology neutral. A related opportunity exists for in-flight WiFi connectivity for laptop users. This is being promoted separately and would use 2.4GHz spectrum which is available worldwide for licence-exempt devices, and therefore does not raise any territorial licensing issues.

6.21 Many of the problems described above do not apply to systems at 2.4GHz. Operating in a band reserved for licence-exempt devices means that interference to terrestrial systems is a less demanding regulatory problem; and no NCU is therefore required. Avionic compatibility may be an issue – noting however, that many airlines now permit laptops once at cruising height (above 3000 metres).
Section 7

Conclusion

7.1 The proposals referred to in this paper suggest a new and innovative application for the use of GSM systems on-board aircraft. There are a number of issues which need to be resolved before such systems can be authorised and implemented. Many of these are the responsibility of other agencies, notably the CAA.

7.2 Ofcom’s role would be in licensing and regulating the proposed services; and in particular ensuring that terrestrial systems do not receive harmful interference from airborne ones. This paper has attempted to set out the principal issues as Ofcom currently understands them.

Q8 Has this discussion paper highlighted the key issues and discussion points?

7.3 If you would like to respond to this discussion paper please contact Richard Young at the address given in section 1.11 above.
Section 8

Summary of questions

| Q1 | Should the provision of services using GSM at 1800MHz be allowed on aircraft if the terrestrial networks and avionic systems are not compromised? Given Ofcom’s statutory role, what other factors, if any, should inform a decision to allow the use of these services on aircraft? |
| Q2 | Is a multilateral rather than a unilateral approach to enabling these types of service appropriate? |
| Q3 | Should the equipment for mobile services on aircraft be licence exempt? |
| Q4 | If licensing for use of the equipment on board aircraft is required, who should hold the licence? |
| Q5 | What considerations (practical or otherwise) are relevant to compliance by the operators of on-board GSM systems with the General Conditions of Entitlement? |
| Q6 | Do you have any comments in relation to competition in the provision of these services? |
| Q7 | Should international mobile network codes be allocated to these on-board mobile systems rather or national codes? |
| Q8 | Has this discussion paper highlighted the key issues, discussion points and posed the right questions? |
Annex 1

Summary of technical study in ECC WGSE

A1.1 WGSE has tasked Project Team SE7 to produce a report detailing the technical compatibility issues of introducing GSM on aircraft. Details of the work undertaken by SE7 can be found on the European Radio Office server at www.ero.dk under ECC Activities / meeting Documents / Select Group / SE7. The password and log in function are redundant and not required.

Scope of the report

A1.2 The report considers the technical impact of introducing GSM services on-board aircraft. The purpose of this work is to investigate the compatibility between GSM equipment (and some required additional equipment) used on-board an aircraft and terrestrial networks. Specifically, the report addresses the impact of the GSM on-board aircraft system on terrestrial GSM and UMTS networks. The GSM on-board aircraft system is assumed to operate in the GSM1800 band. The report will initially address the protection of the GSM900, GSM1800 and UMTS UTRA-FDD 2GHz terrestrial networks.

A1.3 An overview of the proposed system: an on-board cell, linked to the backbone terrestrial networks with a satellite link is illustrated in section 1.14 of this discussion document.

Frequency bands and systems not yet considered by SE7

- CDMA450, Flash OFDM, and CDMA-PAMR
- UTRA-TDD in the 2 GHz TDD bands
- UTRA-FDD and TDD in the 2.6 GHz extension band
- Other IMT-2000 systems operated in IMT-2000 frequency bands (e.g. CDMA2000)
- PMR/PAMR services in the 870-876/915-921MHz band

A1.4 These frequency bands and systems may be addressed in future studies as appropriate, some of these additional systems if completed may be available for the report.

A1.5 The on-board GSM Base Transceiver Station (BTS) and the NCU are operational during the top of ascent, cruise and commencement of descent phases of the flight. These are the stages of the flight where the aircraft is not less than 10,000 feet (3,000 metres) above ground level.

A1.6 SE7 are currently studying six scenarios covering the major interference paths between the airborne and terrestrial systems:

- Scenario 1: No on-board network and the capacity of how a terrestrial network base station could be received in an aircraft at altitudes between 3000 – 10000m;
• Scenario 2: No on-board network and the capacity of how a mobile phone signal on-board the aircraft could be received by a terrestrial network base station at altitudes between 3000 – 10000m;

• Scenario 3: How a single on-board GSM system could effect a terrestrial base station to mobile link at altitudes between 3000 – 10000m and at various positions;

• Scenario 4: How multiple on-board GSM systems could effect a terrestrial base station to mobile link at various altitudes and positions. The probability of multiple on-board systems interfering with a terrestrial down link (ground base station to ground mobile use);

• Scenario 5: How a single on-board GSM system could effect a terrestrial mobile to base station link at altitudes between 3000 – 10000m and at various positions. The probability of an on-board system interfering with a terrestrial uplink (ground mobile to ground base station use); and

• Scenario 6: How multiple on-board GSM system could effect a terrestrial mobile to base station link at altitudes between 3000 – 10000m and at various positions. The probability of an on-board system interfering with a terrestrial uplink (ground mobile to ground base station use);

A1.7 The report also considers what assumptions are made as to what constitutes harmful interference to the terrestrial networks?

A1.8 It addresses what are the limiting factors or combination of limiting factors and values necessary to avoid harmful interference to the terrestrial networks (assuming a minimum height of 3000 meters) e.g.:

• The maximum radiated power level of the NCU depending on the frequency and altitude;

• The maximum radiated power level of aircraft base station operating in the GSM 1800 band;

• The maximum radiated power level of the aircraft mobile station operating in the GSM 1800 band;

• What the exact frequency bands and systems controlled by the NCU are;

• What the minimum average attenuation due to the aircraft required is, in order for the system to work at 3000 meters with and without an NCU, without causing harmful interference to the terrestrial networks; and

• What the minimum height, assuming no attenuation due to the aircraft and with and without NCU, is for the system to work without causing harmful interference to the terrestrial networks.

A1.9 These are being addressed by using two modelling methods: Minimum Coupling Loss (MCL) and SEAMCAT v.3 tool (including simulations for CDMA technology).

**MCL calculations are used to:**

• determine the highest signal value from a terrestrial cell received by a mobile inside the aircraft at a certain height. This level was then used to calculate the needed emitted power of both the on-board NCU and BTS to be used in several of the Scenarios put forward in the SE7 Report (Scenarios 3 & 4 in the SE7 Report).
• illustrate the maximum increase of noise floor in a terrestrial receiver as result of interference from one aircraft in the worst-case position for several of the Scenarios put forward in the SE7 Report (Scenarios 3 & 5 in the SE7 Report).

SEAMCAT simulations are used to:

• illustrate the typical influence in a vulnerable cell. For GSM, the influence of the interference is quantified by the parameter $C/(I+N)$, i.e. the probability that the $C/(I+N)$ is below a limit given by the performance specification. By selecting the “noise limited network option” and specify a certain availability target for the cell, the SEAMCAT tool simulates terrestrial links with a distribution of received signal strength reflecting the defined availability. It has been decided to use 95 % availability of the terrestrial network as baseline. Only voice-service simulation is possible in SEAMCAT, therefore the $C/(I+N)$ (criterion I) was set to 9 dB.

A1.10 The report contains results in 3 categories:

• Cat A) MCL calculations: typically producing worst-case figures, i.e. the nominal (mean) power values of the interference in the worst geometry for the aircraft - victim receiver scenario, and on the limit conditions for the victim link. The result is typically given as “Increase of the noise floor compared to thermal noise”.

• Cat B) Simulations of representative air traffic (e.g. speed, altitude and density) typically estimates the probability of the interference level exceeding a chosen limit. This type of figures gives an indication of how often a disturbance may occur, but assumes that the terrestrial link is of the most vulnerable type (the interference level is compared to the thermal noise floor). Results of this category are obtained from SEAMCAT by choosing $I/N$ defined in the SE7 report as criterion II.

• Cat C) Applying a representative distribution for the terrestrial network conditions, it estimates the real experienced level of interference, since it combines the probability of the interfering signals become above a certain limit, and the probability that the victim links are sufficiently vulnerable. Results of this category are obtained from SEAMCAT by using the $C/(N+I)$ defined in the SE7 report as criterion I.

Terrestrial network modelling

A1.11 The approach taken in the Report to model the terrestrial network has been to use a prior knowledge of the most vulnerable parts of networks and communication situations.

A1.12 It has been assumed that the most vulnerable cases are typically found in light-loaded systems where no internal interference (or interference from other sources) is present. In more heavy loaded networks the performance of a link is already influenced by interference (i.e. the noise floor is higher) so the effect of an additional interfering signal of a certain value is less. A network designed for coverage and a more relaxed availability is therefore more vulnerable for external interference than a high-quality network with large capacity when looking at the probability of interference for an arbitrary connection.
Annex 2

Radio and Telecommunications Terminal Equipment Directive – Article 3

Article 3

Essential requirements

1. The following essential requirements are applicable to all apparatus:
   
   a) the protection of the health and the safety of the user and any other person, including the objectives with respect to safety requirements contained in Directive 73/23/EEC, but with no voltage limit applying;
   
   b) the protection requirements with respect to electromagnetic compatibility contained in Directive 89/336/EEC.

2. In addition, radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communication and orbital resources so as to avoid harmful interference.

3. In accordance with the procedure laid down in Article 15, the Commission may decide that apparatus within certain equipment classes or apparatus of particular types shall be so constructed that:

   a) it interworks via networks with other apparatus and that it can be connected to interfaces of the appropriate type throughout the Community; and/or that
   
   b) it does not harm the network or its functioning nor misuse network resources, thereby causing an unacceptable degradation of service; and/or that
   
   c) it incorporates safeguards to ensure that the personal data and privacy of the user and of the subscriber are protected; and/or that
   
   d) it supports certain features ensuring avoidance of fraud; and/or that
   
   e) it supports certain features ensuring access to emergency services; and/or that
   
   f) it supports certain features in order to facilitate its use by users with a disability."
**Annex 3**

**General Conditions of Entitlement**

General Conditions of Entitlement are made by Ofcom under the Communications Act 2003.

Please note that different conditions apply to different types of operator, depending on the service they are providing.

**Key:**
- GC - General Condition of Entitlement;
- ECS - Electronic Communications Service;
- ECN - Electronic Communications Network;
- PATS - Publicly Available Telephone Service;
- PTN - Public Telephone Network.

<table>
<thead>
<tr>
<th>GC#</th>
<th>SUBJECT MATTER</th>
<th>PTN/PATS</th>
<th>PUBLIC ECS/ECN</th>
<th>ECS/ECN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General access and interconnection obligations</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Standardisation and specified interfaces</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>Proper and effective functioning of the network</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Emergency call numbers</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Emergency planning</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Public pay telephones</td>
<td>Providers of Public Pay Telephones Only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Must-carry obligations</td>
<td>Providers of Appropriate Networks Only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Operator assistance, directories and</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Service Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---------------------</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Requirement to offer contracts with minimum terms</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Transparency and publication of information</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Metering and billing</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Itemised bills</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Non-payment of bills</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Codes of practice and dispute resolution</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Special measures for end-users with disabilities</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Provision of additional facilities</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Allocation, adoption and use of telephone numbers</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Number portability</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Provision of directory information</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Non-geographic numbers</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Quality of service</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A full list of the general conditions of entitlement can be found at:

Annex 4

ITU Radio Regulations - Licensing Condition

A4.1 The ITU Radio Regulations incorporates the decisions of the World Radiocommunication Conferences, including all Appendices, Resolutions, Recommendations and ITU-R Recommendations incorporated by reference.


A4.3 The ITU web address is http://www.itu.int/home/

Article 18.1 of the ITU Radio Regulations.

18.1 § 1 1) No transmitting station may be established or operated by a private person or by any enterprise without a licence issued in an appropriate form and in conformity with the provisions of these Regulations by or on behalf of the government of the country to which the station in question is subject (however, see Nos. 18.2, 18.8 and 18.11).

18.2 2) However, the government of a country may conclude with the government of one or more neighbouring countries a special agreement concerning one or several stations of its broadcasting service or of its land mobile services, operating on frequencies above 41 MHz, situated in the territory of a neighbouring country and intended to improve national coverage. This agreement, which shall be compatible with the provisions of the present Regulations as well as of those regional agreements to which the countries concerned are signatories, may allow exceptions to the provisions of No. 18.1 and shall be communicated to the Secretary-General in order that it may be brought to the notice of administrations for their information.

18.8 § 5 1) In the case of a new registration of a ship or aircraft in circumstances where delay is likely to occur in the issue of a licence by the country in which it is to be registered, the administration of the country from which the mobile station or mobile earth station wishes to make its voyage or flight may, at the request of the operating company, issue a certificate to the effect that the station complies with these Regulations. This certificate, drawn up in a form determined by the issuing administration, shall give the particulars mentioned in No. 18.6 and shall be valid only for the duration of the voyage or flight to the country in which the registration of the ship or aircraft will be effected, or for a period of three months, whichever is less.

18.11 § 6 In the case of hire, lease or interchange of aircraft, the administration having authority over the aircraft operator receiving an aircraft under such an arrangement may, by agreement with the administration of the country in which the aircraft is registered, issue a licence in conformity with that specified in No. 18.6 as a temporary substitute for the original licence.
The ITU Radio Regulations are not freely available and need to be purchased from the ITU at http://www.itu.int/publications/sector.aspx?lang=en&sector=1 at a cost of 252 CHF (Swiss Francs) (£115.99).
Mobile Services on Aircraft

Annex 5

Glossary

2G  Second Generation. The Global System for Mobile communications (GSM) is a second generation cellular telecommunication system which was first planned in the early 1980s. Unlike first generation systems operating at the time, GSM was digital and thus introduced greater enhancements such as security, capacity, quality and the ability to support integrated services.

A  An "A" (Access) link is a SL (Signalling Link) that connects a signalling end point, i.e. a SP (Signalling Point), to an STP (Signalling Transfer Point). Only messages that are originating from or destined to the signalling end point are transmitted on this link.

APT  The Asia-Pacific Telecommunity was established 26 years ago in July 1979. Established by the Joint initiatives of the United Nations Economic and Social Commission for Asia & the Pacific – UN ESCAP and the International Telecommunication Union (ITU), the APT is a telecommunity in the real sense. The APT is a unique organisation of Governments, telecom service providers, manufactures of communication equipment, research & development organisations and other stake holders active in the field of communication and information technology. APT is a dynamic organisation which serves as the focal organisation for communication and information technology in the Asia Pacific region. The APT now has 33 Members, 4 Associate Members and 101 Affiliate Members. Through its various programmes and activities, APT has made a significant contribution to the growth of the ICT sector especially the telecommunications sector in the Asia Pacific region.

BSC  The BSC is the functional entity within the GSM architecture that is responsible for Radio Resource allocation to a mobile station, frequency administration and handover between Base Transceiver Station controlled by the BSC. The BSC function may be physically located with the BTS.

BTS  In cellular system the Base Transceiver Station terminates the radio interface. Each BTS may consist of a number of TRX (Transceivers), typically between 1 and 16. In the GSM system the BTS is also responsible for ciphering of the air interface.

CAA  Civil Aviation Authority. The CAA is the UK's independent aviation regulator, with all civil aviation regulatory functions (economic regulation, airspace policy, safety regulation and consumer protection) integrated within a single specialist body. http://www.caa.co.uk/

CEPT  The European Conference of Postal and Telecommunications Administrations - CEPT - was established in 1959. CEPT is the European regional organisation dealing with postal and telecommunications issues. Original members were the incumbent monopoly-holding postal and telecommunications administrations. CEPT's activities included co-operation on commercial, operational, regulatory and technical standardisation issues. Currently has 45 members. http://www.cept.org

EASA  The European Aviation Safety Agency is an agency of the European Union which has been given specific regulatory and executive tasks in the field of aviation safety. The Agency constitutes a key part of the European Union's strategy to establish and maintain a high uniform level of civil aviation safety in Europe. http://www.easa.eu.int/home/
EC  The European Commission. The European Commission embodies and upholds the
general interest of the European Union and is the driving force in the Union's
institutional system. Its four main roles are to propose legislation to Parliament and
the Council, to administer and implement Community policies, to enforce Community
law (jointly with the Court of Justice) and to negotiate international agreements,
mainly those relating to trade and cooperation.
http://europa.eu.int/comm/index_en.htm

ECC  Electronic Communications Committee. Created by the CEPT to Consider and
develops policies on electronic communications activities in CEPT member countries,
taking account of European and international legislation and regulations. www.ero.dk

EMC  Electro Magnetic Compatibility. The Electromagnetic Compatibility (EMC) Directive
89/336/EEC as amended by 91/31/EEC and 93/68/EEC was incorporated into UK
Law by UK Regulations SI 1992/2372 as amended by SI 1994/3080 and SI
1995/3180. Since January 1 1996, most electrical and electronic products to be
placed on the market in the EEA (European Economic Area) must comply to the
requirements as detailed in the EMC Directive. Products must be constructed so that
they do not cause excessive electromagnetic interference and are not unduly
affected by electromagnetic interference. Certain radio-transmitting equipment must
be subjected to EC type – examination by a notified body.
http://www.ofcom.org.uk/static/archive/ra/topics/conformity/conform-index.htm

ERO  The European Radiocommunications Office (ERO) was formally opened on 6 May
1991 and is located in Copenhagen, Denmark. ERO is the permanent office
supporting the Electronic Communications Committee (ECC) of the CEPT. ECC is
the Committee that brings together the radio- and telecommunications regulatory
authorities of the 46 CEPT member countries.

ERO was established on the basis of a Memorandum of Understanding (MoU). In
1996 this MoU was replaced by the “Convention for the establishment of the
European Radiocommunications Office” which has to this date been signed by 30
CEPT administrations and which defines the terms of reference for ERO and the
funding arrangement.

ETSI  European Telecommunications Standards Institute was established by CEPT in 1985
when the CEPT telecommunication standardisation activities were transferred from
CEPT to ETSI. ETSI is an independent, non-profit organization, whose mission is to
produce telecommunications standards. This activity is supplemented by
interoperability testing services and other specialisms. ETSI's prime objective is to
support global harmonization by providing a forum in which all the key players can
contribute actively. ETSI is officially recognized by the European Commission.
http://www.etsi.org/

EUROCAE  The European Organisation for Civil Aviation Equipment is the agency that
provides the European forum where administrations, airlines and industry can meet
to discuss technical aviation problems. The group is comprised of the main European
administrations, aircraft and equipment manufacturers, and service providers.
EUROCAE are responsible for the preparation of minimum performance
specifications for airborne electronic equipment. www.eurocae.org

FAA  The Federal Aviation Authority are responsible for the safety of all civilian aviation in
http://www.faa.gov
Mobile Services on Aircraft

**FCC** The Federal Communications Commission (FCC) is an independent United States government agency, directly responsible to Congress. The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. The FCC’s jurisdiction covers the 50 states, the District of Columbia, and U.S. possessions. [http://www.fcc.gov](http://www.fcc.gov)

**Gb** A Gb interface is a GPRS interface which is located between the SGSN (Serving GPRS Support Node) and the PCU (Packet Control Unit).

**GPRS** GPRS (General Packet Radio Service) is the world’s most ubiquitous wireless data service, available now with almost every GSM network. GPRS is a connectivity solution based on Internet Protocols that supports a wide range of enterprise and consumer applications. With throughput rates of up to 40 kbit/s, users have a similar access speed to a dial-up modem, but with the convenience of being able to connect from anywhere. GPRS customers enjoy advanced, feature-rich data services such as colour Internet browsing, e-mail on the move, and powerful visual communications such as video streaming, multimedia messages and location-based services.

For operators, the adoption of GPRS is a fast and cost-effective strategy that not only supports the real first wave of mobile Internet services, but also represents a big step towards 3GSM (or wideband-CDMA) networks and services. [http://www.gsmworld.com/technology/gprs/index.shtml](http://www.gsmworld.com/technology/gprs/index.shtml)

**GSM** Global System for Mobile communications (GSM) is a second generation digital cellular telecommunication system which was first planned in the early 1980s, and is now the technology that underpins most of the world’s mobile phone networks. The GSM platform is a hugely successful wireless technology. GSM has become the world’s fastest growing communications technology of all time and the leading global mobile standard. [http://www.gsmworld.com/technology/gsm.shtml](http://www.gsmworld.com/technology/gsm.shtml)

**GSM900** The spectrum range for the GSM900 operation is between 890Mhz and 915MHz for uplink operation and 935Mhz and 960MHz for downlink operation.

**GSM1800** The spectrum range for the GSM1800 operation is between 1710MHz and 1785MHz for uplink operation and 1805MHz and 1880MHz for downlink operation.

**IATA** The International Air Transport Association - was founded in Havana, Cuba, in April 1945. It is the prime vehicle for inter-airline cooperation in promoting safe, reliable, secure and economical air services - for the benefit of the world’s consumers. [http://www.iata.org/index.htm](http://www.iata.org/index.htm)

**ICAO** International Civil Aviation Organisation. ICAO was founded in November/December 1944 in Chicago. ICAO works in close co-operation with other members of the United Nations family. [http://www.icao.int/index.html](http://www.icao.int/index.html)

**IMT2000** IMT2000 is a vision for a single global standard for wireless networks proposed by the International Telecommunications Union. It is often perceived as a global 3G (Third generation) system.

**ISP** Internet Service Provider, a company that provides access to the Internet.

**ITU** International Telecommunications Union. Headquartered in Geneva, Switzerland is an international organization within the United Nations System where governments
and the private sector coordinate global telecom networks and services.

http://www.itu.int/home/

JAA The Joint Aviation Authorities (JAA) is an associated body of the European Civil Aviation Conference (ECAC) representing the civil aviation regulatory authorities of a number of European States who have agreed to co-operate in developing and implementing common safety regulatory standards and procedures. This co-operation is intended to provide high and consistent standards of safety and a "level playing-field" for competition in Europe. http://www.jaa.nl

MNO Mobile Network Operator. A mobile network operator (also known as wireless service provider, wireless carrier, mobile phone operator, or cellular operator) is a telephone company provides services for mobile phone subscribers.

MSC A Mobile Switching Centre is a telecommunication switch or exchange within a cellular network architecture which is capable of interworking with location databases.

R&TTE Radio and Telecommunications Terminal Equipment. RTTE / R&TTE Directive 1999/5/EC is the European regulation applicable to radio and telecommunications terminal equipment. Manufacturers, suppliers and importers of such equipment must apply one of the conformity assessment procedures of the Directive before CE marking the equipment and placing it on the market of the European Economic Area (EEA). This Directive entered into force on 8 April 2000. After this date no new approvals under previous national or European laws could be issued. There was a transition period from 8th April 2000 to 7th April 2001 under which apparatus approved under previous national or European legislation could continue to be supplied. However, from 8th April 2001 all apparatus within the scope of this Directive must comply with its provisions before being placed on the EEA market. The scope of the R&TTE Directive relates to the equipment and components which fit within the definitions of radio equipment and telecommunications terminal equipment given in the directive.

http://www.ofcom.org.uk/static/archive/%20ra/topics/conformity/conform-index.htm

RTCA RTCA, Inc. is a private, non-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management (CNS/ATM) system issues. RTCA functions as a Federal Advisory Committee. Its recommendations are used by the Federal Aviation Administration (FAA) as the basis for policy, program, and regulatory decisions and by the private sector as the basis for development, investment and other business decisions.

http://www.rtca.org

TRX A Transceiver. A device that is capable of both transmission and reception of a signal.

UMTS A 3G mobile communications system which provides an enhanced range of multimedia services. UMTS will speed convergence between telecommunications, IT (Information technology), media and content industries to deliver new services and create fresh revenue generating opportunities. UMTS will deliver low cost, high capacity mobile communications offering data rates as high as 2Mbps under stationary conditions with global roaming and other advanced capabilities. UMTS operates in the frequency bands 1900-1920 MHz (Time Division Duplex), 1920-1980/2110-2170 MHz (Frequency Division Duplex), 2010-2025 MHz (Time Division Duplex).
UNCLOS  United Nations Convention on the Law of the Sea (UNCLOS) (Montego Bay, 10 December 1982). UNCLOS lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources. It embodies in one instrument traditional rules for the uses of the oceans and at the same time introduces new legal concepts and regimes and addresses new concerns. The Convention also provides the framework for further development of specific areas of the law of the sea. 
http://www.admiraltylawguide.com/conven/unclostable.html

WiFi  Short for wireless fidelity. Wi-Fi is an interoperability standard developed by WECA (Wireless Ethernet Compatibility Alliance) and issued to those manufacturers whose IEEE 802.11a and 802.11b equipment has passed a suite of basic interoperability tests. Equipment passing these tests carries the Wi-Fi logo.

WGRA  Working Group Regulatory Affairs of the ECC. This Working Group provides a forum for the regulatory authorities comprising CEPT to study the regulatory, economical and administrative matters related to the use of the radio frequency spectrum and to promote the harmonisation of national legislation throughout Europe, having particular regard to achieving compatible arrangements between the EU and non-EU countries within CEPT. The WGRR aims to accelerate the process of facilitating, simplifying and harmonising authorisation of spectrum use in and free circulation and use of equipment between CEPT countries. A key function of WGRA is to prepare draft CEPT Decisions and Recommendations covering the introduction of new radio systems and services on a pan-European basis.

WGSE  Working Group Spectrum Engineering of the ECC. The SE Working Group has the vital function of ensuring that the usable frequency spectrum can be used with optimum efficiency and effectiveness by the various competing radio services. The major activities of WGSE involve the development of sharing criteria between radiocommunication services, systems or applications using the same frequency bands and the development of compatibility criteria between radiocommunication services using different frequency bands. Many aspects of the work of ETSI are relevant to the efficient use of spectrum and WGSE therefore plays a key role in liaising with the relevant committees in ETSI and reviewing the relevant parameters of radio equipment specifications under development within ETSI.